WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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Fig. 1.

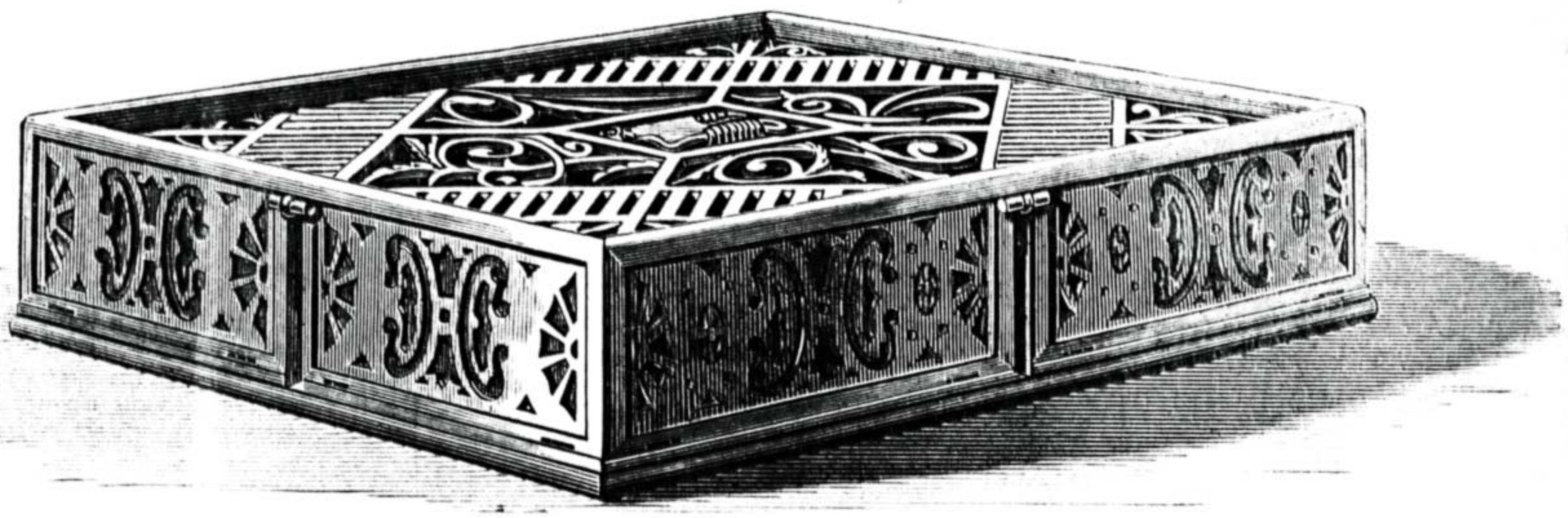
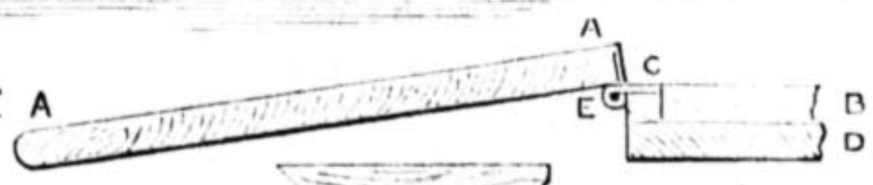


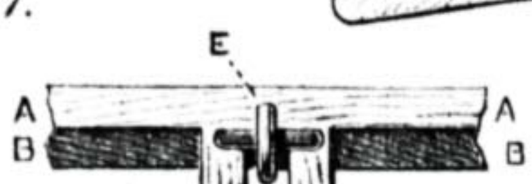
Fig. 2.

Fig. 7.

Fig. 8.

Fig. 5.





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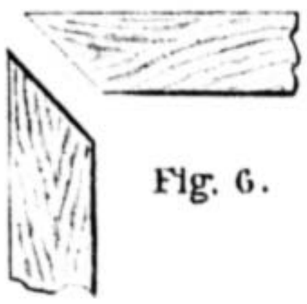

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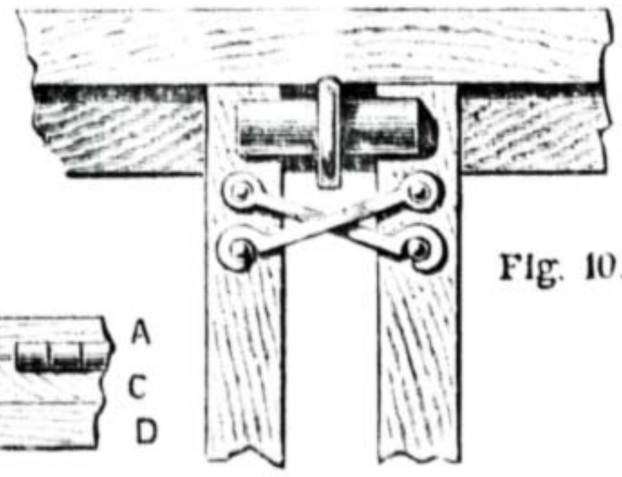

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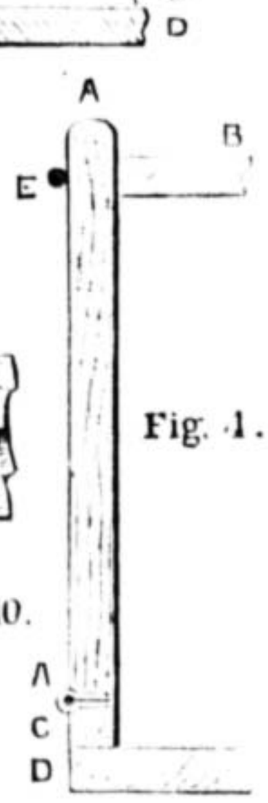

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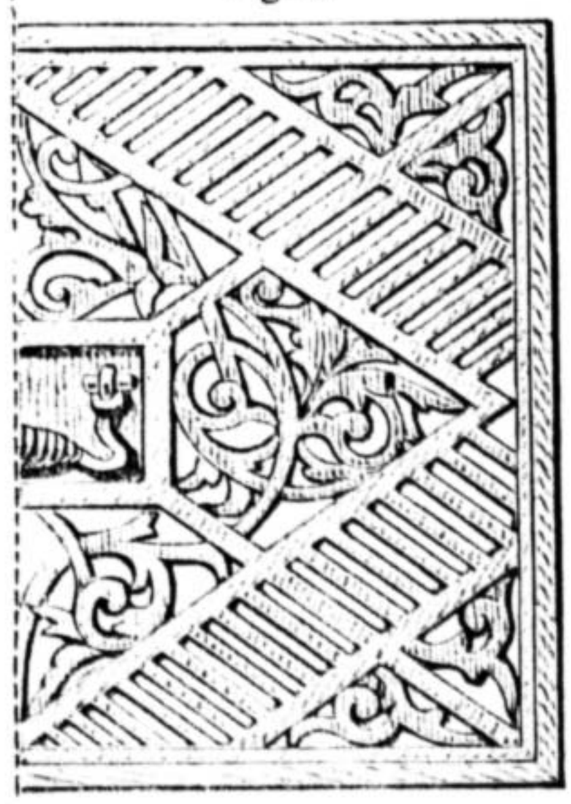

AN ALBUM CASE. Fig. 1.—Case with Album inside. Fig. 2.—Case with Album displayed. Figs. 3, 4, 5. Diagrams showing how Top Board (B) with Peg Arrangement (Fig. 7) works along Side Frames (A, A, A, A). Fig. 6.—Method of cutting Edges of Side Frames. Fig. 7. Peg shown at E in Figs. 3, 4, 5. Fig. 8.—Pattern of Fretwork for Sides. Fig. 9.—Pattern of Fretwork for Top. Fig. 10.—Hooks (either one or two) to keep Top from falling inwards.

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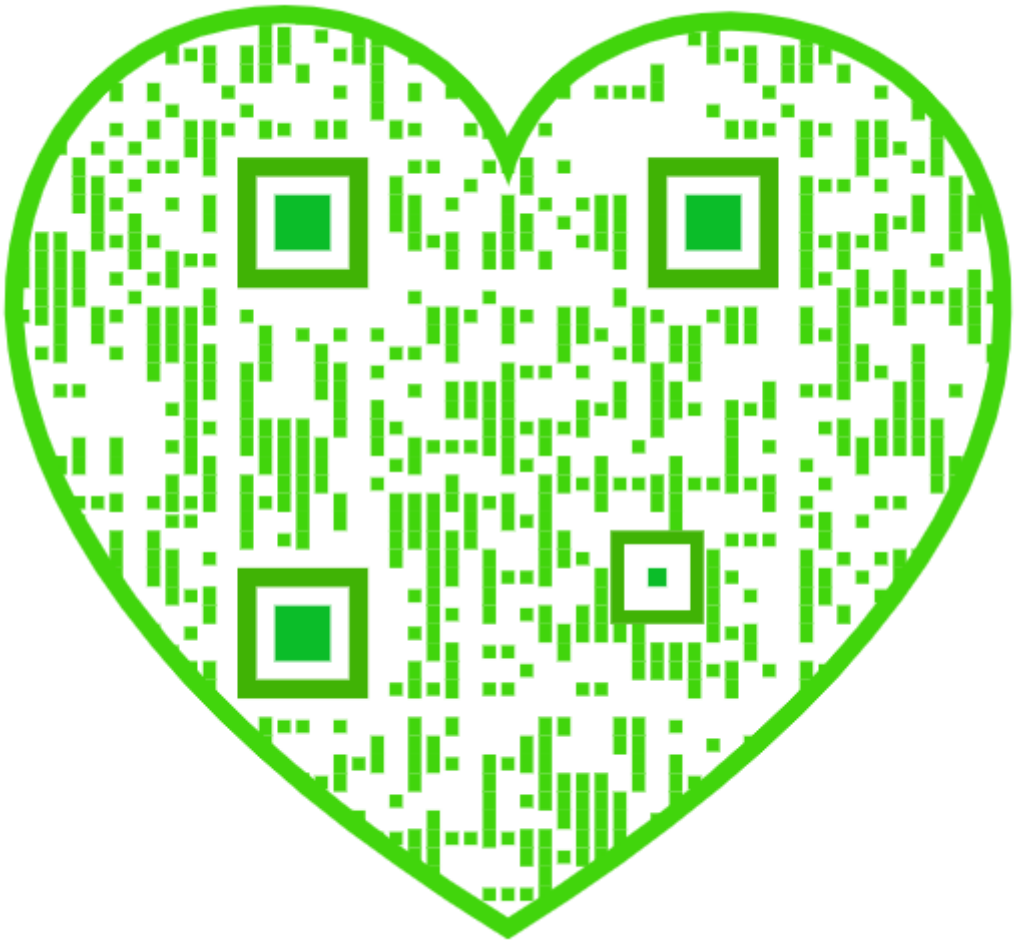

AN ALBUM CASE IN FRETWORK.

BY JAMES SCOTT.

PERSONS who are the possessors of albums, or books of any value at all, naturally have a desire to keep them free from the dust and dirt of daily life, and yet they may have an equal desire to expose them to the eyes of themselves and of anyone who may chance to visit them. The album is, of course, always in demand on the occasion of a visit; but to my mind it does not look right to see it extracted—sometimes with difficulty—from the bottom of some drawer or cupboard; but I am aware that it must be kept in some such place if it is to be taken care of.

With the view of keeping the album always ready at hand, and at the same time to keep it free from dust, etc., I have designed the small article here represented. It will be found very simple to construct, and anyone who can use a fret saw with any amount of skill will doubtless find a certain amount of pleasure, as well as profit, in making one. It is really a fret-cut box, the sides of which are hinged to the bottom piece. When it is wished that the album or book is to be kept free from dust, it is enclosed within the case; when the desire is to exhibit it, it is taken out of the case and placed on the top of it in its opened condition. The top of the case, when empty, is pushed down to the bottom board, the four sides falling down at the same time, three of them being connected with the top part by a peg arrangement (Fig. 7), the other side being free, and serving as a lid.

It will be apparent that a merely fret-cut case will not serve to keep the dust out. Knowing this, and also considering its embellishment, I should advise painted pieces of satin, silk, ivorine, or some similar substance, to be fastened, by means of plush-covered or brass-headed studs, to the inside of each side piece, and also to the under part of the top board. The effect to be produced by this showing through the fret-work will be very pretty, and it will afford a desirable change as ornament when the album is displayed upon it.

It will be almost useless to give sizes of this case, as the dimensions of albums, etc., vary so much. Unless the hooks shown in Fig. 10 are used, it will be preferable to make the case of such size that the intended contents will just fit it. If the hooks are made use of, it will not matter if the case is a little larger than the album.

All the parts used in the framework should be of the same thickness. Fig. 1 shows it as it would appear with or without the album inside it. Fig. 2 shows it as it would look when open, and with the album displayed upon it. It will form a tasteful ornament whichever way it is shown, and will not be without its use. All the parts are connected one with the other, and whether open or shut, neither part will be entirely separated from its fellow pieces.

First—we have the bottom board, which should be a trifle larger than the outside dimensions of the case proper, and rounded on its edges. Round the top of this is fitted pieces of the same thickness, and square in section. Presuming that on one long side will be the lid, it will be necessary to cut a small piece from the middle of each of these last-named pieces (C, C, C, Figs. 3, 4, and 5), with the exception of that piece on the side of the lid. Then for each of the three side frames we require one long top strip, two bottom pieces, and four uprights. These are joined together, as can be seen by a glance at Figs. 1 and 3. The lid need consist of only four pieces. Each end of each of the four sides will have to be canted, to allow them to fit properly together (Fig. 6), and must not be glued. The top part must be of a size that will fit *exactly within* the sides. A peg (Fig. 7) is intended to be screwed into the thickness of the top part on three sides, in such a manner that it will work freely up and down the space in the middle of each of them. E, E, E, in Figs. 3, 4, and 5, indicate this peg. When the top board (B in Fig. 3) is pushed down it will fit between the three pieces C, C, C (Figs. 3, 4, and 5), thus releasing the sides A, A.

A small handle must be fitted in the centre of the top board, and must be sunk flush with the surface of the wood; as, if it projects above it, the album will not lay flat. Fastenings for the lid are so numerous that I shall not dwell upon them here.

This idea admits of a great deal of improvement. The sides might be higher, and shaped on top, instead of being quite straight, as I show them; or the case might be raised on four turned columns or brackets, thus allowing the four sides to fall down perpendicularly. Then, of course, different patterns of fretwork more according to the taste of the maker could be used. At all events, whether carried out as I describe or improved upon, as I said before, a pretty and useful ornament can be made.

THE ART OF GRAINING.

BY A LONDON DECORATOR.

GRAINING ROSEWOOD, AMERICAN WALNUT, BIRCH, TEAK, AND OTHER FANCY VARIETIES OF WOOD.

THOSE varieties of native or foreign woods the imitations of which have already been treated in this series may justly be considered the staple lines of the grainer's craft. Beyond these, there are, however, a useful selection of woods without a practical acquaintance of which no competent grainer must rest satisfied. Ever-changing fashions in furniture and cabinet work have much to do with the demand for or neglect of some of these imitations; I have, therefore, selected those likely to be of the most practical service to the worker of "to-day."

American Walnut is a hard wood so much in vogue at the present time, and withal of such an admirable nature for painted imitation, that I give it some prominence in this selection. The ground for this should be of the medium oak shade, but very much more *neutral* than the grounds for knotted walnut. Although a little Venetian red and ochre are required for the colour, the burnt umber pigment must be in excess of both, a "drab" resulting.

If executed upon woodwork which is well lighted, the imitation is best without much contrast between ground and grain colours; but for ordinary staircases and dark positions the ground should be kept lighter, this plan being preferable to overloading the graining with strong glazes and black veins of pigment. In imitating this wood, we may get a very passable effect in one distemper process; but for good work, binding down and a second treatment is necessary. Assuming that an ordinary door is being worked, we will take the first method. The tools most useful for this imitation are a thin oak overgrainer, a large mottler or worn-in sash tool, a veining fitch, and the indispensable "water tools"—badger, sponge, and leather. Good burnt Turkey umber, finely ground in water, gives the best colour for the graining; but as this is rather difficult to get, vandyke brown may readily be substituted for it. A portion of this pigment being rubbed up with the palette-knife and also a little ivory or lamp-black—the latter worked up with beer—they are placed handy in separate vessels; whilst some dilute beer will also be required. With the mottler, or large tool, we first rub in the panels of our door, dipping the brush first into the clear liquid, and then into the brown pigment. By using the brush slantways down the panel, we readily get a variety of *shades*, and give a lead to the grain. With the badger we then work in a finer grain, using it not as a softener, but with pressure upon the sides of the hair. After a little practice it will be found that every required variety of grain can thus be made, and a natural softness is finally given to it by delicately softening this work *across* the grain at a slight inclination. The panels are now allowed to dry, and for many purposes this is all that need be done to them. The stiles are next rubbed in and treated in the same manner, working up from the bottom, and finishing each rail and stile as we proceed. The moulding "quirks" must, of course, be done with the stiles, and the success of the latter will naturally depend upon the *variety* of colour-depth and grain we get when rubbing in and badgering. If the broad mottler is used for spreading the colour, we may get the occasional effect of cross-reflected lights upon the stiles, and these in the badgering are broken up to the least possible extent. The mouldings are run in at the last, and with either a darker or lighter tone than the rest of the door, or, better and quicker still, coated with beer and pure black, in imitation of ebony. When well varnished this combined effect is very good, and particularly agreeable to those who believe in the grainer always "operating with reserve." When "cost" is subjective to effect and finish, we varnish the first graining, and then with a hog-hair veining fitch proceed to run in the dark top veins. If the panel is now rubbed over with a *slightly stained* weak beer-wash, we can the better work the fitch and soften off the veins. The stiles may here be slightly darkened all over; they will then "cut up" and contrast much better with rails in which a little strong grain is put in, than were all parts to be equally figured. From the foregoing, it will be gathered that the badger is the most important tool used, and that for the threefold purpose of making and softening the undergrain, and for stippling the plainer portions, no better means could be desired, nor better effects otherwise obtained.

Rosewood, or Palisander—by which latter name it is generally known in continental Europe—is a variety of hardwood that is now rather out of fashion for furniture. There are very few persons, however, who have not seen it, if only in the form of a fancy writing-desk, or such article. As rosewood has characteristics not common to any other wood here mentioned, and since it is a very useful variety for ornamental work and imitation inlays, I append brief instructions for graining it.

Rosewood is found in many varieties in India, South America, and Africa, and that with which we are most familiar is of a dark and rich general tone, having a ground of red shades, and being beautifully marked with dark brown and black figure and veins. This red ground may be made with Venetian

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red, a little white lead, and burnt umber. If for a bright and strongly marked sample, vermilion may be used with the Venetian, whilst yellow ochre will furnish more orange tones, if desired. The earlier grainers were rather partial to the bright reds, but the most natural and "restful" imitations will be obtained with softer and broken tones. In graining, we may with advantage use warm tones—vandyke and burnt sienna—and also the cool tones of indigo or blue-black; or for a simpler effect, a mixture of sienna and black will suffice. In both cases a good black pigment is required for the veins, and a little victoria or mahogany lake for the after-glazing.

The tools are those we use for mahogany and walnut, the appearance of rosewood partaking of the silky mottle and rich colour of the former with some of the strong figure and veins of the latter. A thin "warm" wash of dilute beer being spread with the tool or mottler, and with varied and richer tones of colour, the panel is then streaked into light and dark portions of wood. The light portions are now broadly mottled with a "cool" wash, and then the whole softened. Whilst still wet, we take the thin oak overgrainer, and put in the black and vandyke veins, working the tool as for walnut, but with more black and less curly markings. The veins are now well badgered, and any plain portions may be stippled ere the panel dries. If desired, it may afterwards be wetted over with clean water and a broad mottler, and the black veins then worked up and added to with the veining fitch or sable pencil. Varnishing, or "binding down," comes next, and then a wash of mahogany lake and vandyke. This is slightly mottled or wiped out with the leather, the knots worked up and shaded, and then all softened with the badger, after which a good coat of varnish completes the imitation. The richness and beauty of good rosewood can scarcely be gathered from such small surfaces as were previously indicated. A piece of old solid rosewood furniture which recently came under my notice, and the wood for which had been brought to this country by a master mariner, was of such unusual beauty, that I was almost tempted to try and reproduce it in black and white herewith; but wiser thoughts prevailed. It consisted of a large heart-shaped centre or knot, out of which bright and reflected rays, or lights, spread out on either hand; shaping up and surrounding which was black veining of so pretty and symmetrical an arrangement, that had it been a grained imitation, I verily believe any person acquainted with the subject would have condemned it for this very prettiness. It is therefore advisable that the student of graining should endeavour to fix in his mind all such natural grain arrangements of the more costly woods that he may come across, and then work them out in his practice and study.

Teak is another variety of Asiatic growth, imported for the most part from India and Further India. It is of very massive growth, and its extremely hard and durable nature makes it invaluable for ship-building purposes. In the neighbourhood of seaport towns we occasionally find it used for the ornamental parts of house woodwork and for furniture. Its varying qualities of suitability for cabinet-work—some logs being much more amenable to fine work than others—give it only a limited scope in that line. In appearance it partakes of the grain of pitch pine, but in colour, when polished, it more nearly approaches cheap walnut. It may be easily imitated in water graining, after the method explained for pitch-pine. The ground is rather stronger in yellow than for walnut, and much lighter in tone. The graining colour should be brown, free from any "lakey" tone—either burnt Turkey umber or black and burnt sienna—and the veins and figure pure black and very deep browns. The general method of working advised for the two preceding imitations may be followed for teak with equal success.

Imitations of Birch are seldom used for house woodwork, but may be usefully employed for furniture, since bedroom *suites* of the real wood are much in demand. As it is impossible to explain its exact appearance to the student by letterpress or verbal description, I merely append the simple mode of working it, which will be easily interpreted with a real specimen to study from. The ground is a light clean buff, made from white lead, stained with either yellow ochre or raw sienna in oil. In graining, we brush over the surface with a thin wash of warm brown, making the panel of two or three broad colour shades. With a large maple mottler we then mottle from the darker parts into the light, working slantways as for maple, but leaving a broad and stiffer mark. While this is still wet we soften the panel, and then slightly mottle across the previous work to break it up. When this is thoroughly dry we carefully wet the work over with clean water and a clean mottler, and then put in the darker overgrain with a thin oak overgrainer or overgrainer in tubes, using a stronger wash of the same graining colour. A light varnish is advisable for this imitation.

Silver Wood imitation is a variety that has also been, at times, much in request as a finish for bedroom furniture. In "genus" and "order" silver wood is really related to the sycamore and maple, and when graining it many experienced workers rather exaggerate the blue-grey tone which is usual to the real wood. Since woods that possess a general cool tone are very uncommon, this slight forcing of its blue colour may at times be a pardonable matter, but when used in combination with red woods, for imitation inlays, its natural greyness only should be aimed at.

The ground for silver wood should be quite white, prepared from white lead or zinc white. If, as is usually the case, the imitation be worked upon oil-paint ground, it is as well to slightly neutralise the yellowness of the linseed-oil by adding a touch of blue-black. The graining colour is a weak beer wash, stained with blue-black and indigo blue (finely ground in water). This being spread, the "silvery" mottle is worked with a camel-hair mottler in straight sharp lines across the panel, making some portions plainer, as with maple. If the work permits, we at once proceed to wipe out the clear reflected lights from amongst the previous mottling, this being done with, preferably, an old, or "burnt edge," camel-hair mottler. Should the panel dry too quickly over the mottling process, we may leave it until, by wetting over again with clean water, we are able to obtain the desired effect. To finish the imitation, we now put in a fine straight overgrain, crossing the mottling at right angles, and after the growth of the plainer treatments of maple. A thin wash of vandyke brown, used so that the overgrain is just perceptible, will bring out the full value of our cool tones, and whilst softening the form of the mottle will give the faint warm hue which is found in this variety of real sycamore. Softening and stippling with the badger will further be advisable, as in all water-graining. It need scarcely be added that the purest of white varnish should be used for silver wood. For furniture, much of this work is done upon distemper-prepared grounds, as explained in an earlier paper, and for finishing which a white *spirit varnish* is used.

Tulip Wood imitation is an ornamental variety, very useful for painted inlays, being of a rich red colour, and having an uncommon appearance of grain. The tree which is popularly so styled is seldom seen growing to any size in this country, and rarely elsewhere than in gardens. The mature growth of a hundred feet is, however, common to it in its natural climes of North America. Although used both by cabinet-makers and coach-builders, it is seldom worked in any size for furniture. Its imitation for inlay-work may easily be obtained upon a light yellowish-red ground by spreading a thin coat of mahogany lake and a little vandyke thereon. This is slightly stippled, and then the cross lines of darker reds are painted in with an overgrainer or pencil, according to size of surface, using the lake and burnt sienna to the desired tone. When used for inlay the stripes are shown crossways of the line or ornament.

Amboyna Wood is the name of a richly coloured variety, so called from the place it is imported from—viz., the Island of Amboyna, of the Moluccas. Its chief characteristics are masses of small knots, somewhat similar to the clusters found in our native pollarded oak, the colour, however, being brighter and more gairish. As this is seldom used in mass, but only for small surfaces or inlays, imitations of very small knot-clusters of oak will usually suffice. For graining, the ground may be similar to that for tulip wood, or rather more yellow. The knots are put in with a round fitch and pencil, using burnt sienna and burnt umber, or vandyke and sienna; and the final glaze, after binding down, may be done with varying tones of red and brown.

New Zealand Oak—or Yew, as it is sometimes termed—is a wood very similar to Amboyna, so far as growth and grain goes, but without any of the redness of the latter. In large surfaces we find the masses of knots surrounded by very pleasing surfaces of a plainer nature, wherein are fine grain and soft mottle—in fact, all the features of English pollard oak upon less regular lines. The best colour for imitating this is burnt Turkey umber, with vandyke brown for warmer parts and for the glaze and overgrain.

Purple Wood is the name given to a very deep red variety. As it is used chiefly for fine lines and in minute pieces, its colour-opacity, or positiveness, is the main quality. It is usually worked in soft veins and markings of mahogany lake, ivory black, and vandyke upon a very deep red. In the cheaper imitations of inlay upon light furniture Indian red pigment alone is used.

Black, for painted imitations and inlaying of ebony, may be either lamp-black well rubbed up with old beer, or ivory-black, which can usually be obtained finely ground in "turps." This latter should be put on blotting-paper to draw out the turps, and may then be readily mixed with beer. For line work and fine ornament the purest neutral black must be used; and the simple plan described above is much to be preferred to that of imperfectly rubbing up the dry drop black.

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THE MECHANICAL PROCESSES OF SCULPTURE.

BY MARK MALLETT.

CARVING IN MARBLE.

THE MATERIAL, CARRARA AND SICILIAN MARBLES—ROUGH-HEWING—THE POINTING MACHINE—WORK OF THE POINTER—WORK OF THE CARVER—TOOLS: THE CHISEL, THE HAMMER, THE DUMMY, THE DRILL—SHARPENING TOOLS—CARVING HAIR, FLESH, ETC.—RASPS—SANDING MARBLE—STOPPING HOLES—REMOVING DISCOLORATIONS—POLISHING MARBLE—CARVING WITHOUT POINTING.

MODELLING clay and plaster of Paris, however admirable may be the forms embodied in them, are but mean and unenduring materials; and the noblest works of the sculptor cannot be said to have reached their full development until they have been carved in marble. Sir Joshua Reynolds, in one of those well-known "Discourses" for which it has been claimed that they are "canons in art," goes so far as to affirm that sculpture deals with but *one* material—namely, white marble. We of the present age are more catholic in our ideas than were the men of old Sir Joshua's time. We admit that there may be sculpture worthy of the name in metal, in terra-cotta, in stone, in ivory, or even in wood, as well as in marble; nevertheless, marble remains the most noble, the most beautiful, and, all things considered, the most enduring, of the various materials which the statuary has at his disposal.

The marbles used by the sculptors of old Greece, and so familiar to us in classical writers, and in allusions to ancient art—namely, the Parian and Pentelic—are unknown to the practice of the modern worker. Those used by us are almost exclusively Carrara, for indoor, and Sicilian for outdoor purposes. It is the Carrara which we emphatically term *Statuary Marble*, and it is a material worthy of such a distinction. It is imported in good blocks, of a pure, uniform, and brilliant whiteness, semi-translucent, admitting of free cutting and of the most delicate finish. Its defects, or rather, shortcomings, are that it will not bear exposure in the open air to the climate of this country, and that it readily stains or becomes discoloured with smoke. It is costly in England, especially in large and fine blocks; its price, which varies considerably with the quality and size of the blocks, may be, say, from 25s. to 50s. per cubic foot at the importer's yard.

It is quarried at Carrara in Italy, where are works which have been carried on for ages, and some of them are on a colossal scale. The texture varies somewhat in different blocks. Some are much softer than others, and cut with comparative ease; but the sculptor generally prefers the harder blocks, if they are not too hard and flinty, as they permit of much finer finish; the softer blocks are apt to have too great a resemblance to loaf sugar, and to crumble on the edges where delicate work is attempted, which more than counterbalances any advantage they may offer as regards easy working.

Sicilian marble, of which the name denotes the source from which it is derived, is of a firmer, closer, and if the term may be used, tougher texture, than Carrara. It suffers little from exposure to the weather, and is for that reason preferred for monumental purposes and outdoor sculpture generally. Though white, it has not the sparkling, snowy brilliancy of Carrara, but inclines to a slightly bluish-grey tinge; it is nevertheless very pleasing to the eye when the block is one of uniform colour, but it is more subject to dark veins and spots than Carrara. It is less expensive than that variety, costing at a London importer's yard, say, perhaps, 8s. or 9s. per cubic foot. In this there is no difficulty in obtaining blocks of large size, as there may sometimes be in Carrara. Some carvers say that they prefer working in Sicilian, for though harder and needing more highly tempered tools, it has no tendency to crumble, and the chisel can be used upon it much more freely and boldly than on the more delicate stone.

Both kinds of marble are subject to dark spots or markings, more or less, which may be almost or quite imperceptible in the rough block, and only become apparent when the mass has been hewed into something like its required form. These are sometimes so disfiguring as to necessitate having another block. A person of experience in marble working ought, however, from the outward appearance of a block, to be able to form a tolerably close estimate of its internal colour.

The labour of rough-hewing a block of marble into the form of a statue or other piece of sculpture is necessarily very considerable, and contrary to the traditional practice of Michael Angelo, the ordinary carver leaves this to be done by a mason. He can do this in safety by the help of an apparatus known as the "pointing machine." This instrument is of vast service to the art, not only in the above-named respect, but also from its leaving, after the mass of superfluous material has been removed, a series of points or measured distance marks on the face of the marble, which serve to guide the carver in his work. Though the carver is not supposed to do the work of a pointer, it will be both desirable and interesting to explain the manner in which this invention acts. The rough diagram, Fig. 32, will serve to illustrate its principle.

In this we will suppose A to represent a graduated bar of iron, fixed in front of a stone table, on which the plaster model to be pointed from is placed; B will represent a metal upright, which can at pleasure be pushed backwards or forwards on the bar A, or removed from it; C is a cross-arm sliding up and down the upright B; D is a second cross-arm, united to C by a joint, and having at its other extremity a socket, through which a needle, E, can be played backwards and forwards. The workman wishes to take a point, say, on the lobe of the ear. He marks a dot there with his pencil, and so arranges his machine that the end of the needle will just touch the dot. All the joints of his instrument are so arranged that by turning screws they can be rendered perfectly rigid. Having made them quite tight, he moves his machine to a second graduated bar, fixed in front of a second stone table, or "scale stone," on which the block of marble is placed. The scale marked on the second bar is precisely the same as that on the first, and he places his machine at the number corresponding to that from which he has removed it; and it will now be obvious that (as all the joints remain unaltered) when the needle is pushed through the socket to the same distance, it will touch a point on the marble that will exactly correspond with the dot on the model. The pointer hews away as much of the superfluous material as he now sees that he may remove with safety, and drills a hole into the block until the needle will enter to the required distance. The point being now found, he makes a dot on the marble at the bottom of the hole with his pencil, and is then ready to take a second point.

Fig. 34.—Sculptor's Drill and Bow.

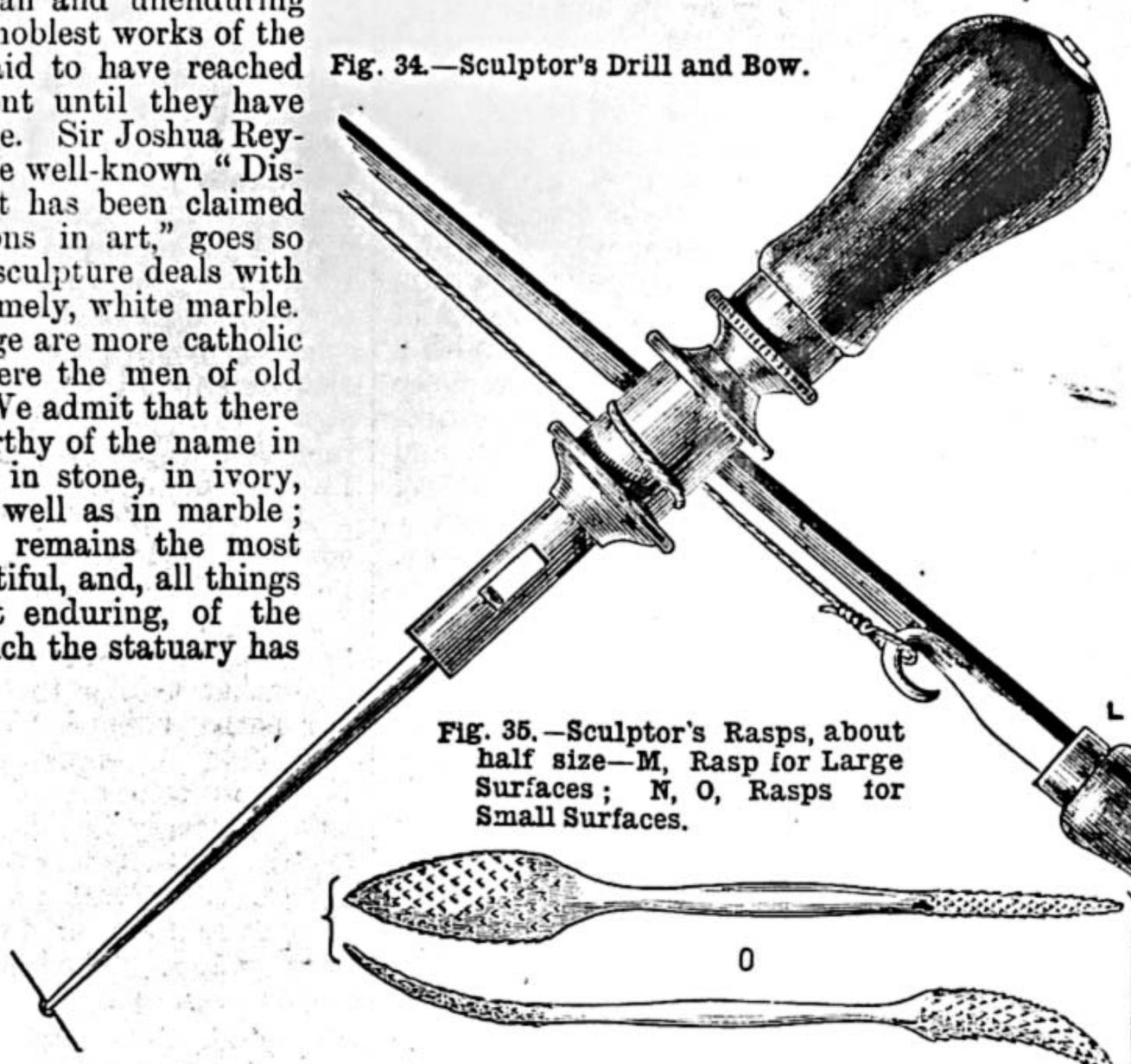
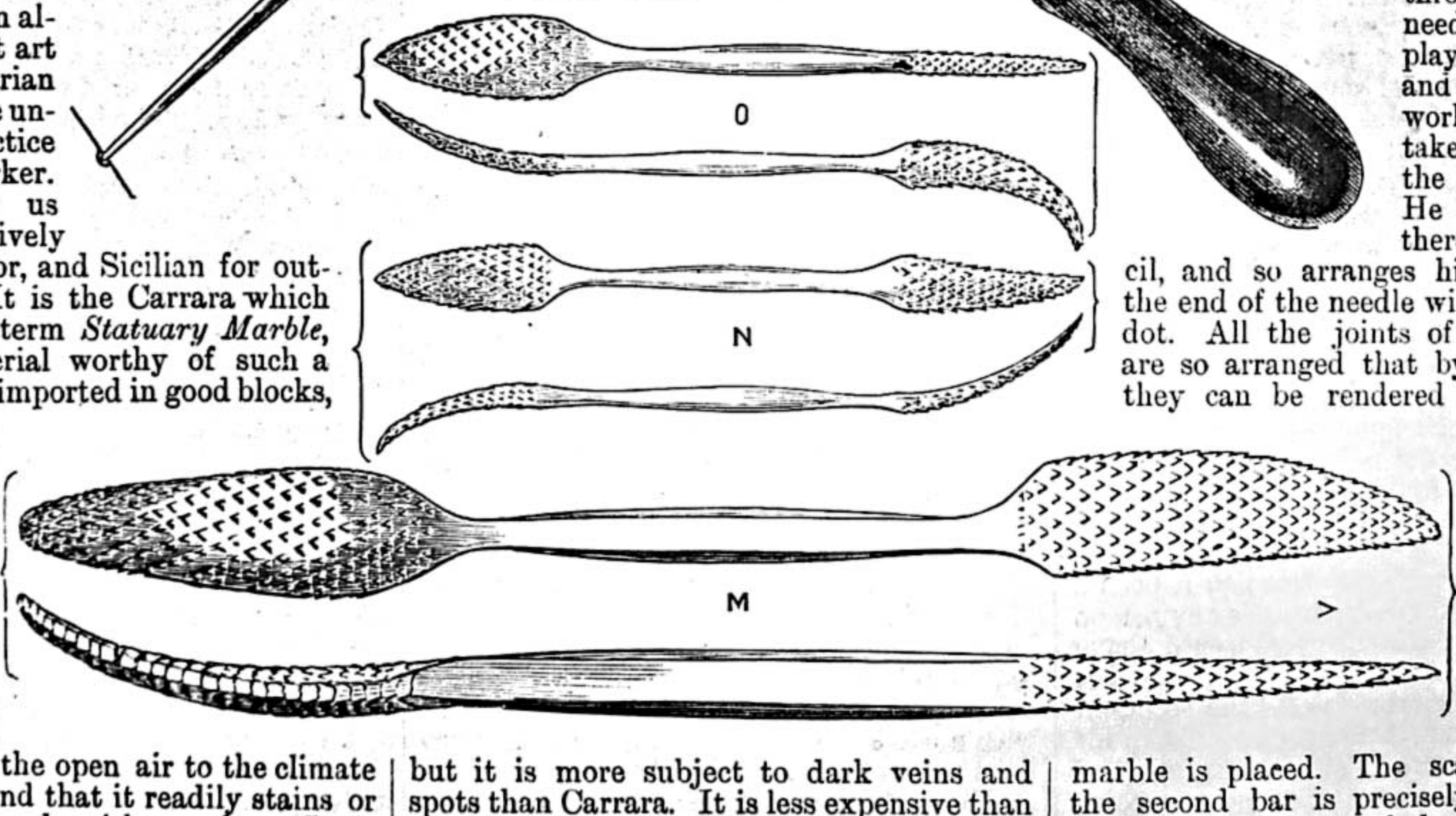


Fig. 35.—Sculptor's Rasps, about half size—M, Rasp for Large Surfaces; N, O, Rasps for Small Surfaces.



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This diagram is made as simple as possible, that the principle of the apparatus may be more clearly explained, but the reader will see that by interposing additional lengths between C and D, with joints which can be made to bend in every direction, there will be no part of a work of sculpture to which it will not be possible to bring the end of the needle, E, or to take a point. Every required measurement can thus be transferred from model to marble with all but mathematical precision.

So far as we are aware, the pointing machine was unknown to the sculptors of classical times, and to the masters of the Renaissance. Our own great portrait sculptor, Sir Francis Chantrey, has the credit of perfecting it. Before its introduction, measurements had to be taken in a primitive manner, with plummet and compasses. It is chiefly used in marble work, in which great accuracy is most essential, but it is sometimes applied to carving in soft stone, and in wood.

In rough-hewing the marble the workman employs the pick rather than the chisel—a pointed rather than an edged tool. This shells off the waste material in large flakes, and is less liable to bruise or "stun" the marble beneath than a cutting tool. D, Fig. 33, is a small pick.

The number and frequency of the points to be taken depend on circumstances. In the more important parts, as in the face, or where detail abounds, it may be desirable that they should not be more than the fraction of an inch from each other; whilst on broad and comparatively unimportant surfaces, as, say, about the back, it may be sufficient for them to occur at much less frequent intervals. But the carver, as a rule, likes to have plenty of points. With the dots to guide him, the pointer is able to clear away the superfluous material to within, in most parts, ¼ in., or even ⅛ in., of the required surface. In the latter part of his work he exchanges his picks for chisels, and in thus roughing-out the hair and some other portions he will probably use a "claw tool"—that is, a tool with a notched edge: G, Fig. 33, is an example of a carver's claw tool. The block of marble when it leaves the pointer's hands, and whilst as yet untouched by the carver, will generally bear a far stronger resemblance to the finished work than might be supposed possible.

At this time both model and marble have a curious appearance, however, from being pitted, so, to speak, all over with dots in blacklead, those on the marble being all at the bottoms of little holes. The carver requires his work to be perfectly firm; if, therefore, the marble is not of sufficient size to stand without moving under his blows by its own weight, he fixes it with plaster to a block of stone; and that the different parts of the work may be readily brought under the eye and hand, it is well to have a strong turn-table on which to carve, the model being placed on a turn-table beside it. If the object be a bust, it is well to have the head much on a level with that of the carver, as he *stands* at his work; and the light, as in modelling, should fall on model and marble alike, and somewhat from above.

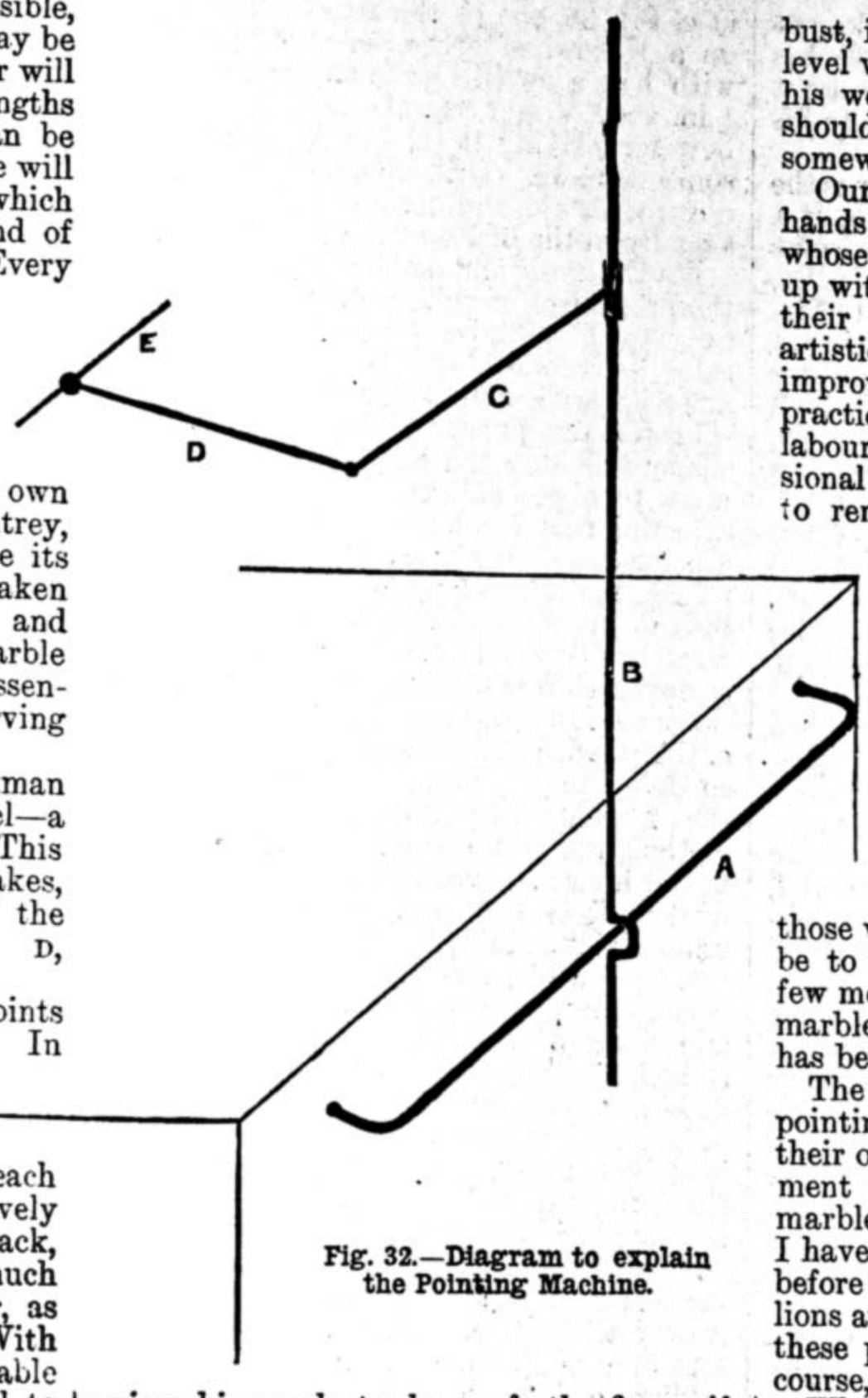

Fig. 32.—Diagram to explain the Pointing Machine.

Our best-known sculptors, men whose hands are always full of commissions, and whose valuable time is almost wholly taken up with modelling, are accustomed to limit their work on the marble to some few artistic finishing touches, and such minor improvements on the model as they may find practicable at the last. By such men the labour of carving is chiefly left to professional carvers, whose business it is simply to render the marble a facsimile of the plaster model. Skilful art-workmen, if not artists, are needed for this, and many of those so employed in this country are Italians. Indeed, it is not an unknown thing for English sculptors to send their models to Italy to be copied in marble near the quarries. The humbler class of sculptors who are less full of employment commonly do their own carving, and so do most amateur sculptors. Indeed, those who follow the art for pleasure, would be to blame if they did not, for there are few more pleasing occupations than carving marble, after all the laborious rough hewing has been done by the pointer.

The more busy sculptors have their own pointing machines, and employ pointers on their own premises; those of less employment place their models in the hands of marble masons who point "for the trade." I have the prices of one of these persons before me. He undertakes to point medallions at from £3 3s.; busts, at from £6; to these prices the cost of the marble has, of course, to be added.

When the carver begins his work, following the pointer, he has no need to trouble himself as to the general form or proportions; of these the machine has already taken care. He has little more to do than to look to the due rendering of such forms as lie between point and point. His work is thus, especially in its earlier stages, wonderfully simplified. As he works down more nearly to the required surface he will, however, find that neither the pointer nor his machine is absolutely infallible. In a delicate work of art, an error of but the fiftieth part of an inch may have serious results, and some of the points are sure to be a little beside the mark, or the holes may possibly have been drilled scarcely far enough, or a trifle too far, and must therefore be accepted with caution;

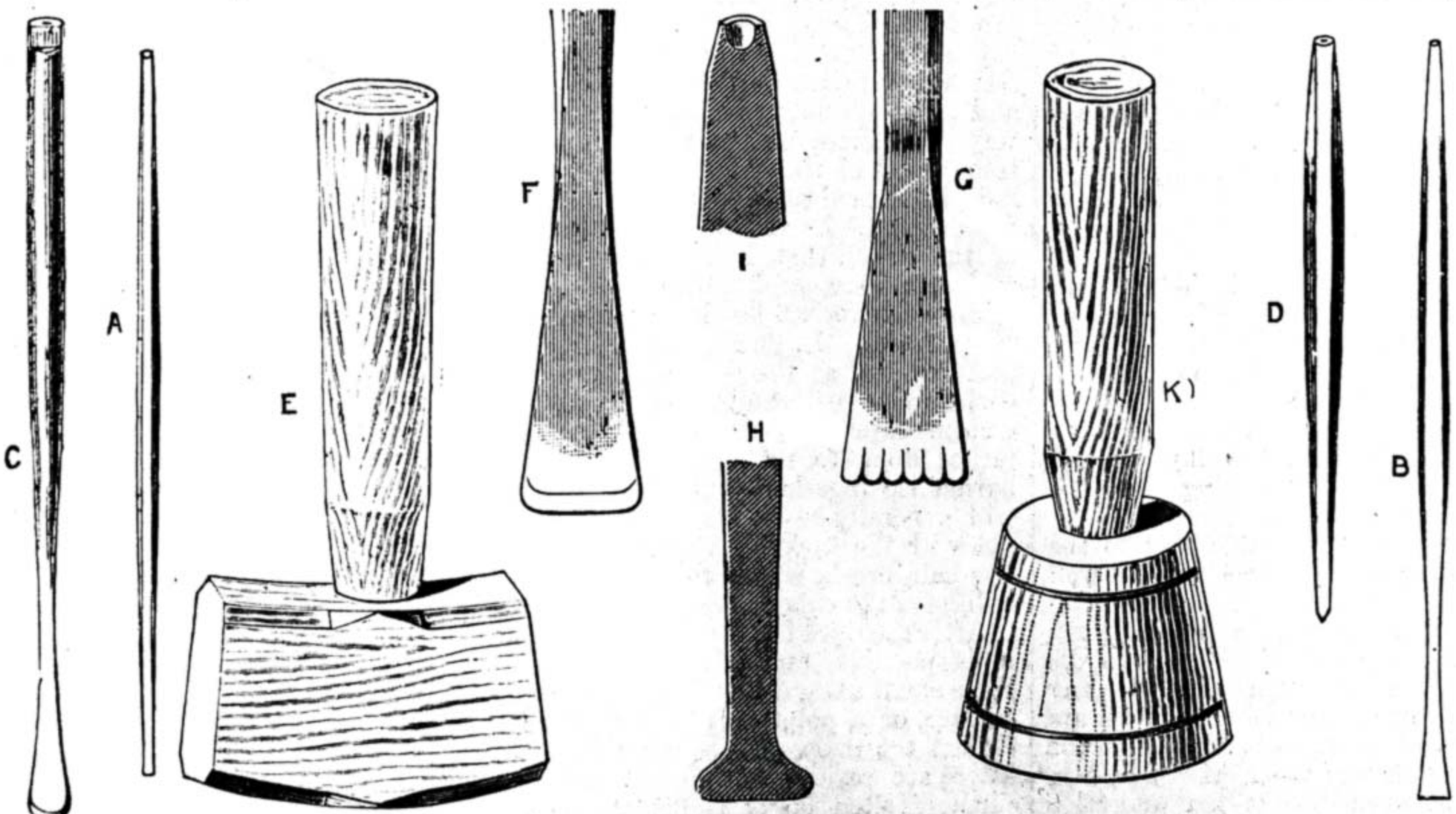

Fig. 33.—Tools for carving in Marble—A, B, Carver's Chisels; C, Boring Bit; D, Small Pick; E, K, Sculptor's Hammers; F, Chisel with Corners rubbed down; G, Carver's Claw Tool; H, Section of Chisel for carving Soft Stone; I, Section of Head of Carver's Chisel.

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presently some of them will work out altogether; and as his work approaches completion the worker will have to trust less and less to the points and more to his eye.

The more especial tool of the carver is the chisel. Some of these tools are drawn at A and B, Fig. 33. They will be perhaps some 8 in. long, and ⅓ in. thick at their middles, and will have cutting edges from ⅛ in. to ¾ in. wide. Their heads, instead of having a broad, flat surface like the tools used for carving soft stone (a section of one of which is shown at H, Fig. 33), will have a narrow, cup-formed head, such as is shown in section at I, Fig. 33. This form is given that the hammer may bite upon it and not slip when driving the chisel through the hard material which has to be cut. Such tools will cost, say, from 6s. to 9s. per dozen. When bought, they will have sharp square corners, as in B, Fig. 33, but at least some of them will be found more useful if the corners are rubbed down and rounded off more as in F, Fig. 33. Against so hard a material tools soon become blunted, and need frequent grinding or rubbing to an edge again. A slab of Yorkshire paving-stone with water answers very well, and a finish can be given on an ordinary oil-stone. After repeated rubbings they will become too thick, or the ends of some may snap through the temper being too short. Some of the tools will always be out of order, for which reason the carver should scarcely have less than a dozen to start with. The disabled tools have to be handed over to a blacksmith to be drawn out and retempered. It is well to give this mechanic a hint as to the kind and hardness of the stone on which they are to be used, that he may temper them accordingly: the ordinary charge for drawing out and tempering is 6d. per dozen.

These tools are either driven with a sculptor's hammer or with a dummy. The hammer is shown at E, Fig. 33. It has a short handle and a thick heavy head of solid steel, weighing some two or three pounds. Such a hammer costs about 3s. 6d., and for refacing it when battered with hard work the blacksmith will probably charge 4d. The dummy, K, Fig. 33, has a handle of much the same length, but is not quite so heavy in the head. It is chiefly used for carving the hair and similar parts, which, unlike the flesh surfaces, are finished by the chisel. The dummy is most frequently made of lead, but this is a little too soft and is soon battered out of shape. Zinc is sometimes used, but this is full hard. Pewter, which is between the two in hardness, but more expensive, makes an excellent dummy. Dummies are bought per pound according to the metal.

The chisel when in use is held at an oblique angle to the surface of the work; for if held at too nearly a right angle, there would be danger of bruising, or as it is technically termed, "stunning" the marble. When this is done, instead of a sparkling surface there will be a dead chalky one, and in the final operation of "sanding," much of the bruised material will work out.

Another and most valuable tool to the marble carver is the drill. This is safe as well as useful: there is no danger that it will stun the marble. The occasions on which it can be employed are numberless. It can be brought into use wherever there is any decided hollow or undercutting; with it are formed the openings of the ears and of the nostrils, the corners of the eyes and mouth, the hollows between locks of hair and folds of drapery, etc. etc. Fig. 34 shows a sculptor's drill and the bow for turning it, and at C, Fig. 33, one of the bits for it is drawn on a somewhat larger scale. Such a drill, with half a dozen bits running up to, say, ½ in. wide, would cost about 25s., whilst the bow for driving it (L, Fig. 34) would cost some 2s. more. Drill bits, like chisels, wear down with use, and need to be placed occasionally in the blacksmith's hands.

On the flesh and similar parts, it is not the practice of marble carvers to chisel quite down to the actual surface. It is considered safer to remove the last film of waste material with rasps. These are made and sold for the purpose in a vast variety of shapes and sizes. In Fig. 35 are drawn three rasps to about half the actual size: M is a splendid tool for large surfaces; N and O are for small work; M would cost about 3s. 6d., the others 9d. or 10d. each. As left by the rasps, the surface has of course a scratched look, but the scratches can be removed with medium and fine sand-paper.

Some few carvers finish their work entirely with sand-paper, holding that by so doing they preserve a better colour in the marble; but this is not the usual method, nor is it the one which the writer would himself recommend. The further and final process commonly employed is that known as "sanding." The worker takes a little piece of some soft and even grained wood, pine generally, say, of much the size and shape of a finger (any wood with a ribbed, unequal grain is not suitable, as it does not wear away regularly). This will be rounded at the end, but the exact form is of little moment, as it will soon wear and shape itself to fit the surfaces with which it is brought in contact. He wets some fine washed and sifted sand in a saucer or similar vessel, and dipping his stick into it, works it over the surface of the marble, giving a sort of circular motion as he does so, and taking up fresh sand as often as he requires it. The sand must be free from coarse and gritty particles or it will scratch the work. The effect of this sanding is to remove the chalky appearance, and to bring out the beautiful sparkling translucent qualities of the marble. After a part has been sanded, and the sand washed off with a sponge, it will often be seen that some scratches still remain, and that a local re-sanding in places will be necessary. The sticks used in this process wear away rapidly.

But there are some parts of the work in which a brilliant surface is not desirable, and these are not to be treated in the same way. Of these will be the hair, probably some parts of the drapery, etc. As to the hair, it is usual to leave it almost untouched from the chisel. It is by continuous strokes of the chisel that hair is represented in sculpture, these strokes being more sweeping or more abrupt as flowing or crisp hair is to be shown. In some places, indeed, as for instance just at the parting line, it may be desirable to use sand-paper, and even to a certain extent to sand—the latter being rather done to make the different parts harmonise together—but in such cases it will generally be better to apply the sand not with the stick, but with a scrubby, hard, hog-hair brush, which, to a certain extent, will have the effect of regular sanding.

After the work has been otherwise finished, it is possible, and indeed probable, that some small natural holes may appear in the surface, or a point or two may have been drilled too deep. These must be stopped. There are various substances used as stopping. Melted borax is held to be a good and lasting one; upon Sicilian, for outdoor purposes, a mixture of white lead, japanner's gold-size, and turpentine makes a good and enduring stopping; for indoor work in statuary marble, nothing is more easily applied than spermaceti wax, which can be squeezed in cold with the point of a knife. Such holes, if they occur at any specially important part, are an annoyance, but far worse are the natural discolorations, dark spots and markings, which perhaps do not develop themselves till the surface is almost reached, or possibly do not show till the work is sanded. Should one of these occur in either of the more delicate features, as the eye or the mouth, it may altogether change the expression. It would seem impossible to have any absolute security against these disfigurements, but the best hope of avoiding them lies in leaving the choice of the block to an experienced marble-mason.

Merely accidental stains and discolorations, which can be removed, are less vexatious. Brooke's "Monkey Brand" soap answers very well for removing ordinary dirt and grease from marble, or a very efficient mixture may be made by dissolving American potash in warm water, and stirring in powdered whiting so as to form a paste. This has to be painted on the marble, and when washed off it brings all dirt with it. As there is a possibility that the caustic potash may corrode the face of the marble, it is not well to let it remain on too long; a few minutes only will suffice in ordinary, but obstinate stains need more time. Some recommend chloride of lime for an obstinate stain, but the writer has known potash left on for twelve hours remove every trace of stains on which the chloride had no effect. Not unfrequently, and more especially in the foul atmosphere of our large towns, the marble will seem to get thoroughly impregnated and discoloured throughout with smoke. This is not easy of removal. But something may be done by laying the piece of marble in water, so that a small portion only may remain above the surface, and on this exposed part sprinkling dry, powdered pipe-clay or whiting. The water drives the colouring matter upwards and the powder absorbs it. Some say that a bath of wet sand is better than water for this purpose.

In connection with carving, it is sometimes found desirable to polish certain parts of the marble. Such parts have to be rubbed down perfectly smooth with sand and water, then with the coarser and the finer grit-stones (grits Nos. 1 and 2), next with snake-stone; and the actual polishing is finally done with "putty powder." This powder is applied wet with a pad of thick felt glued on wood, and a considerable amount of patient rubbing is needed to get a good polish. The addition of a little "salt of sorrel" helps to brings the polish more quickly, but this last is a thing to be used with caution. Both the putty powder and felt are sold by the pound, and all these materials are supplied by marble merchants.

The small round pedestal or stand on which it is usual to mount a bust, and which is commonly polished, is both turned and polished in a lathe. Making this is rather the work of the marble mason than the carver. This craftsman will hollow out the back of the bust, prepare the pedestal, and fix it on with a copper bolt, for about 25s. or 30s., marble included.

It has throughout the above remarks been assumed that the carver will have followed the ordinary and convenient course of having his work pointed. But it must not be inferred from this that pointing is absolutely necessary.

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Sculpture existed long before the pointing machine, and could go on without it. The importance of the machine as a saver of time is not to be questioned, yet there are those to whom time is of less value than money, and these can, if they like, work without it. The beginner in marble carving may not be well able to spare the few pounds or shillings which the pointer would demand, and he will get as good or better practice by working at first more from the eye. Probably the majority of first works in marble are carved without pointing. Such a matter as a medallion may easily be copied with accuracy by measurements with the compasses, and on some work of this kind the first essay will most likely be made. For roughing out such a relief, the small pick, D, Fig. 33, will be found a useful tool; as also will the claw tool, G, Fig. 33, when the surface is more nearly approached.

For gaining familiarity with the use of the tools, and with the nature of the material, it is, perhaps, quite as well that the beginner should make a first attempt without pointing.

HINTS TO WATCH WEARERS, AMATEURS, AND OTHERS.

BY HERR SPRING.

In my last article I took the opportunity to deal with the variations which are caused in the time-keeping of watches by changes of position. Readers of my preceding contribution in page 679 of this Volume will remember that with an experimental watch of ordinary quality we found in lying on its back for eight hours it gained twenty seconds, but when hung up for eight hours it lost ten seconds, being a total variation of thirty seconds. By a process described in my last paper we contrived to reduce the error to fifteen seconds in eight hours, which, of course, was a long stride in the proper direction. But I promised that in this article I would endeavour to show how the existing error may be still further reduced. Although there is no great certainty that in the case of an ordinary commonplace watch a much greater degree of accuracy can be obtained, still we must make the attempt. What I am about to say is difficult to say with perfect lucidity; moreover, it may be "above the heads" of some of the readers who have followed my former contributions. But I have no doubt that my observations on the question of "positions" will be of very great service to some of the more advanced readers of WORK; at any rate, we cannot always be in smooth water. With this brief apology, let us jump *in medias res*. It will be found that the rounding of the jewel holes, the "touching up" of the balance pivots, and the other little arrangements described in No. 94 of WORK, have not only reduced the error in positions from thirty seconds to fifteen seconds in eight hours, but have also improved the action of the balance, and therefore added to the time-keeping qualities of the watch generally. Let us assume that the variation of fifteen seconds is made up as follows:—In hanging up, five seconds slow; in lying on its back, ten seconds fast. Now let us try to find the remedy. In the first place, you can do a great deal by manipulating the hairspring. Bring the balance to a dead stop, and then examine how the hairspring stands in the curb-pins. Then let the balance go on, and observe the action of the hairspring in the curb-pins until the motion of the balance reaches its highest point. Now, when the balance is at its highest point (which it reaches when lying on its back), you will see that the hairspring in expanding presses hard against the outside curb-pin: an action which, of course, tends to make the watch go fast in lying. Therefore, with a suitable instrument move the outer curb-pin the least degree more outwards; by this alteration the hairspring will not press so tightly when the balance is at its highest point of motion (when lying down), and the action in the curb-pins will be nearer equal in lying and hanging. It is possible that this alteration might effect all the change needed, but one cannot say this with certainty. However, we have by this means brought the watch nearer to true time. The next thing which can be done will tend to diminish the losing rate of five seconds in hanging. Take the watch in your hand so that the twelve o'clock be uppermost if it be an open face, and the three o'clock uppermost if it be a hunter. Then, having your eye in the right direction, seize the outer coil of the hairspring, and gently bend it in such a way that you throw the whole body of the spring slightly in the direction of twelve or three o'clock, as the case may need. The result of this is that when the watch is hanging up the tendency of the spring, owing to the bend, will be more upwards than previously—it will expand more towards the twelve or three o'clock. The extra expansion upwards will, in a slight degree, lift the balance upwards, and therefore lighten the downward pressure of the pivots when the watch is hanging up. These two alterations, though they can be done in a few moments, may make a vast improvement in the error. The variation of fifteen seconds in two positions in eight hours may now be reduced to seven and a half seconds, which, for argument, we will suppose to be all in one position—that is to say, the watch is now going right to time in hanging, but is still gaining seven and a half seconds in lying down. Now, the most sensible thing would be to stop any further experiments, but if you wish it we will try one more. Take the balance carefully out of its place, and with a ruby file flatten the point of the bottom pivot the least bit in the world. You must not flatten the whole point of the pivot, for that would make an immense alteration, and destroy all you have so far accomplished. The faintest touch of the ruby file is quite sufficient. You need to flat the point only so much that when you examine the end of the pivot with the strong glass you see merely the extreme part of the dome touched. If you have no ruby file, use a good burnisher, seeing in both cases that the flat you make is really at the extreme point of *the point* of the pivot. This touch of flatness creates a little extra friction when the watch is lying down, and causes it to go slower. There are numerous little experiments that may be made in connection with timing in positions, but I do not think it advisable to carry the matter any further than I have done. If, however, any of the readers of WORK find themselves in want of information or in a difficulty, I shall be glad, with the Editor's permission, to answer their inquiries on each and every point. I cannot, however, close this paper without explaining that the above experiment is, from a scientific point of view, comparatively crude. But we have been dealing with an ordinary commonplace watch, and have had to make the best of a bad case. There are, be it remembered, other positions in which a *good* watch should be tested. A first-class instrument, made with a special view to accuracy in positions, must be tried lying down, with twelve up, with three up, and with nine up. Then you will observe a watch when at rest in the waistcoat pocket is neither upright one way or the other. The size of the pocket, the weight of the gold chain, the shape of the body of the wearer, each tends to give the watch, when in the pocket, some special position, and that may possibly be just the one position in which there is a maximum of error. I am acquainted with some careful watch wearers who possess the finest-rated watches; but the finest watch has its faults. One man has a watch whose rate is one second in twenty-four hours slow in hanging, and one second fast in twenty-four hours in lying. Now, this wearer is terribly precise, and is greatly disturbed if his watch goes out even a few seconds. So he utilises his knowledge of its positional variation to keep it very near mean time. If, from one cause or other, his watch begins to take a losing rate, he keeps it lying down through the night, and whenever he has an opportunity, and as it gains in lying, he gradually brings the losing rate back to mean time, and *vice versâ*. I must caution people who hang their watches on a nail at night that the practice is a bad one. The motion of the balance of a watch gradually conveys itself to the whole watch, and, as a result, I have seen a watch on a nail swing about almost like a pendulum. There is also a danger in watch-bags hung over the bed. Such bags are usually very loosely made, and when the watch is put into them it may take all sorts of unexpected positions—leaning forward or backward, sideways or what not. A watch-bag over the bed should be so made that the watch is always in one position.

AN ADJUSTABLE READING DESK.

BY LAWRENCE S. LITTLE, C.E.

Although by no means an advocate for the wholesale "transmogrification" of all kinds of articles (and especially articles of furniture) into *something else*, or of the folding up and uncomfortably jointing and hingeing that which would look far better in its natural (?) state, and, generally speaking, contriving that

"Things are not what they seem;"

so that a cupboard becomes a bedstead, a pocket-knife an armoury of offensive and defensive weapons, a travelling bag a canoe, etc., etc.; yet I frankly admit that it is expedient that considerations of space, etc., over which we have, occasionally, little or no control, should *sometimes* decide this point for us.

Accepting this dictum, I designed, some time ago, for the use of a scientific society, the Adjustable Reading Desk here illustrated. It was required to stand on an ordinary table, or other like support, to give a considerable range in height, suited to the varying altitudes of the speakers at the society's meetings (which, like the subjects they discuss and the length of their communications, fluctuate considerably), to be adjustable to varying angles, and to be rigid enough to resist even those orators who, like some popular preachers, are sufficiently energetic to "ding the stoor oot o' the pupit."

It will be observed from the drawings that the top may be placed at any desired

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slope, either backward or forward, or horizontal, and, with some simple modifications (such as making the projecting lower edge to turn round so as to present a plain rounded edge), a very useful writing or drawing table may be constructed in the same way.

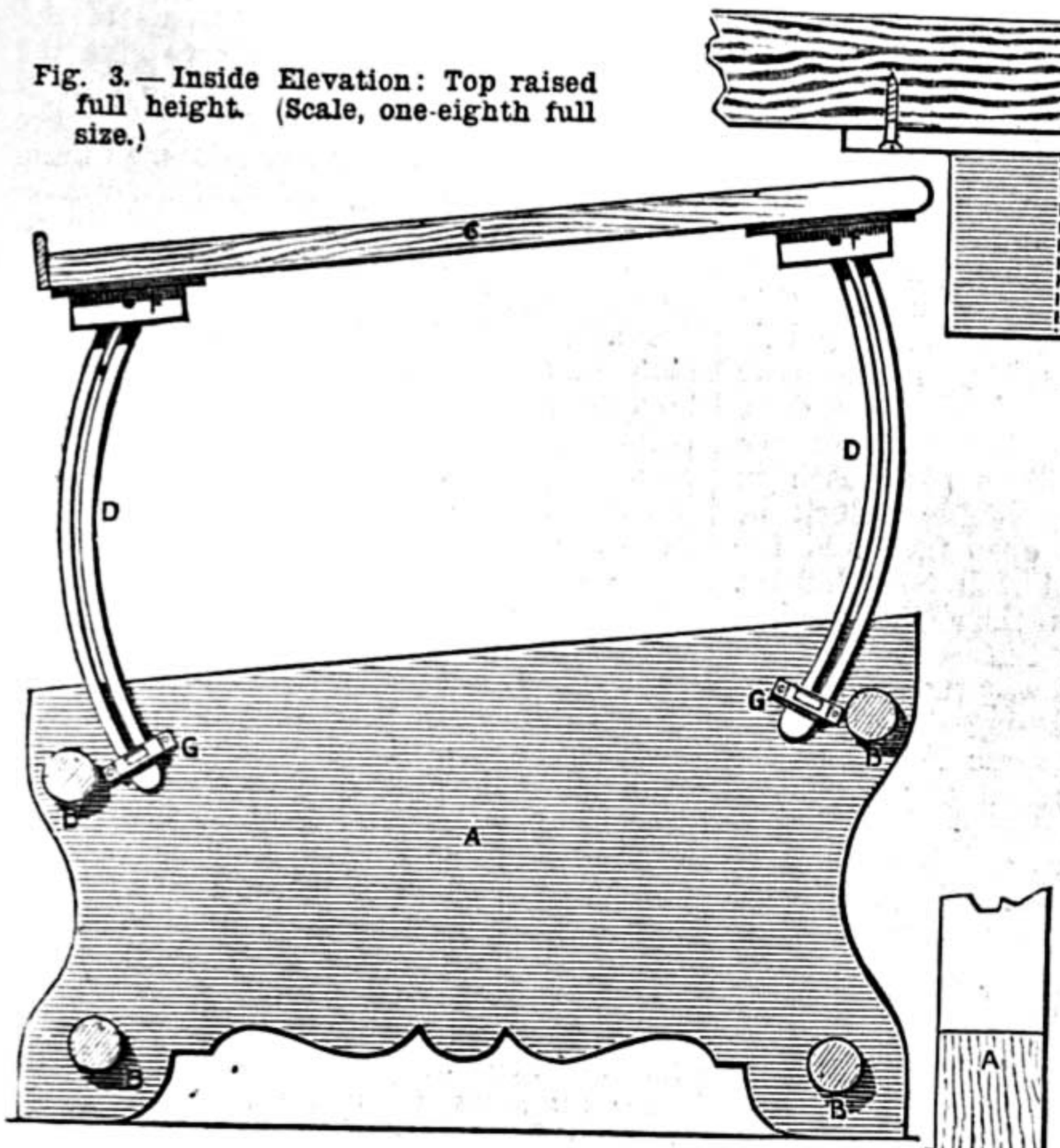

Fig. 3.—Inside Elevation: Top raised full height. (Scale, one-eighth full size.)

Very little description is required, the whole working and proportions of the various parts being seen from the drawings. Suffice it to say that all the woodwork is of walnut; the slides, boxes, and nuts with handles, are of gun metal, and the screwed bolts of iron. It is adjusted in the required position in a moment, and can be raised to about 11 inches above its normal height. The whole arrangement, which is in regular use, has given perfect satisfaction, and any reader of WORK with a turn for cabinet making could, with ordinary care, construct something similar. Needless to say that all the parts must be carefully fitted.

The standards A, ¾ in. thick, are connected by the four rails B. The top C, also ¾ in. thick, carries the flanged boxes F, in which are hung the slotted slides D, working on ¾ in. bolts E, having oblong heads (which are held in position by the hasps G). The nuts H, working on the bolts E, with washers, clutch the slides to the standards and fix the top in the desired position. No guide pins are required, and the top is prevented from swinging past the line of front or back by the heel of the slide, which is rounded, working against the ends of the box. The play of the slides can be regulated, if necessary, by means of screws through the boxes. Some of the parts are a little too heavy, and might, with advantage, be lessened. This, as the reader will readily understand, will give a lighter appearance to the desk.

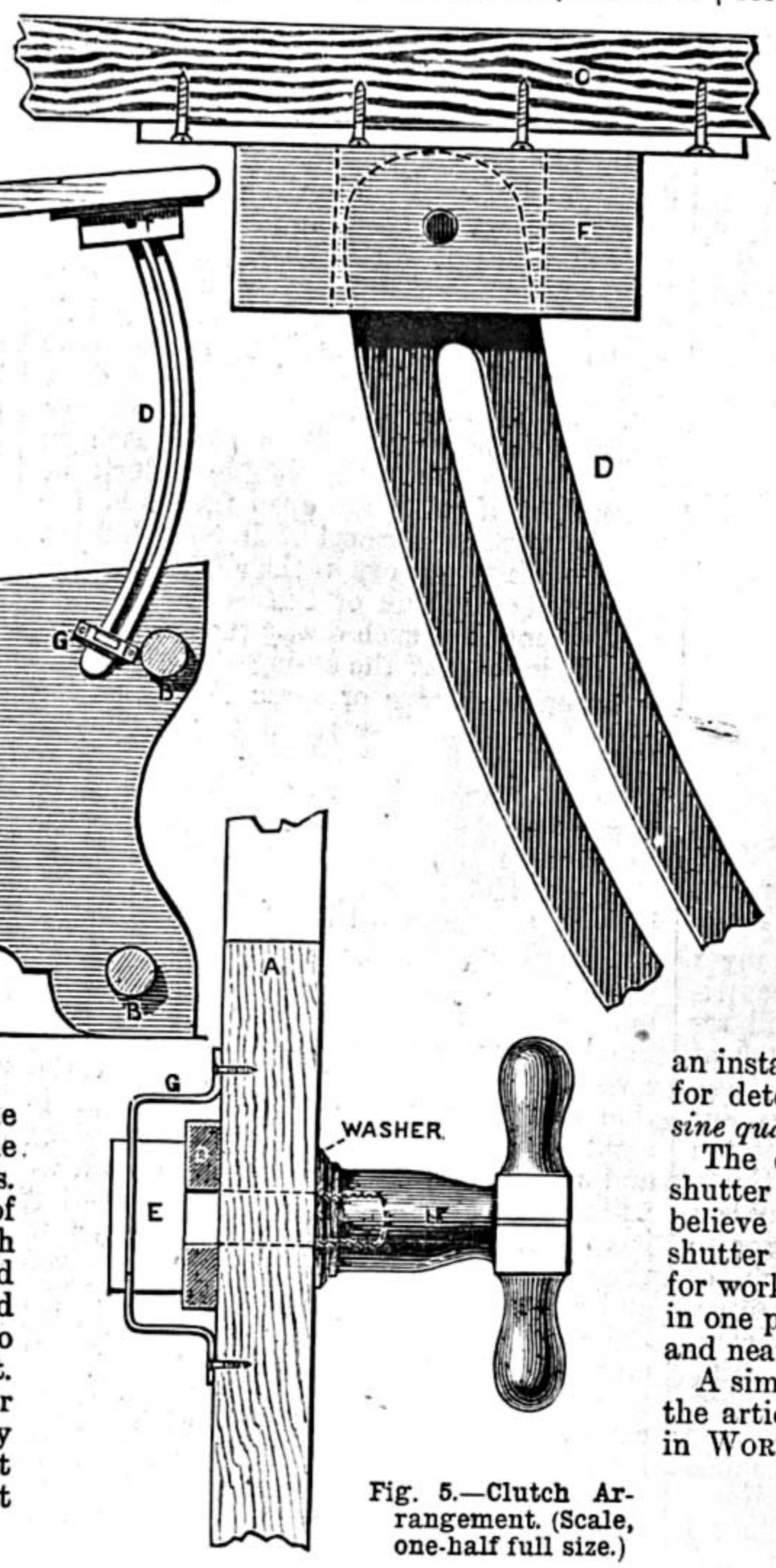

Fig. 5.—Clutch Arrangement. (Scale, one-half full size.)

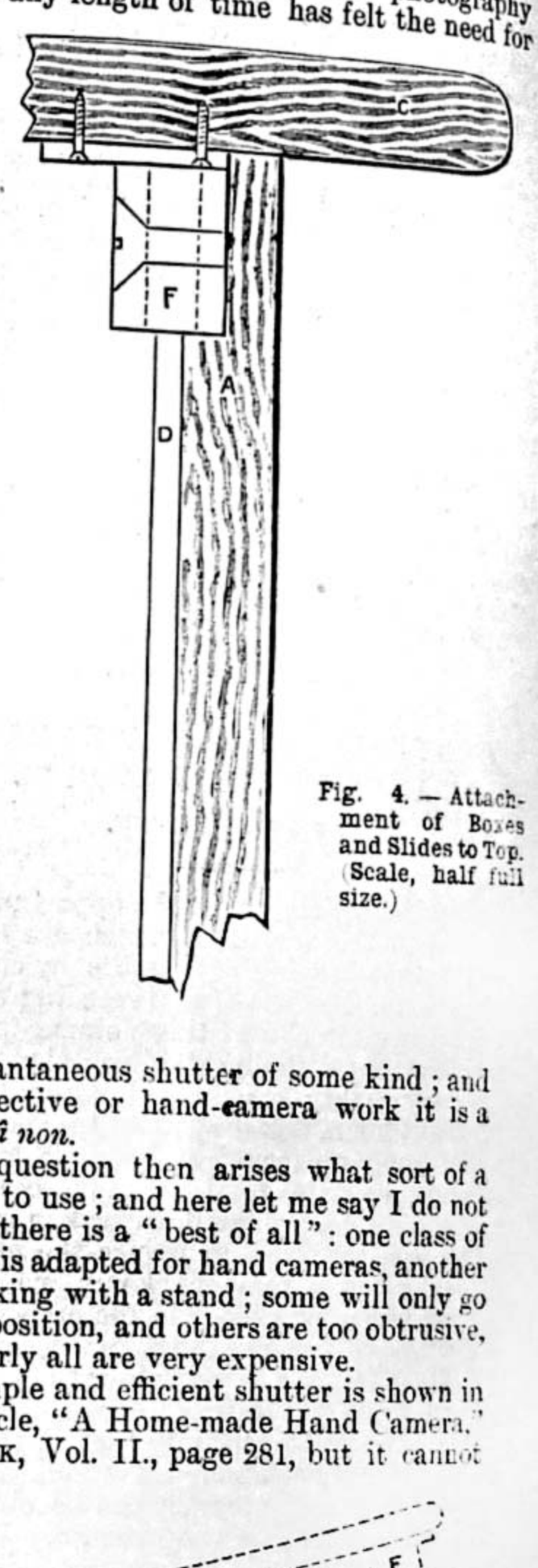

Fig. 4.—Attachment of Boxes and Slides to Top. (Scale, half full size.)

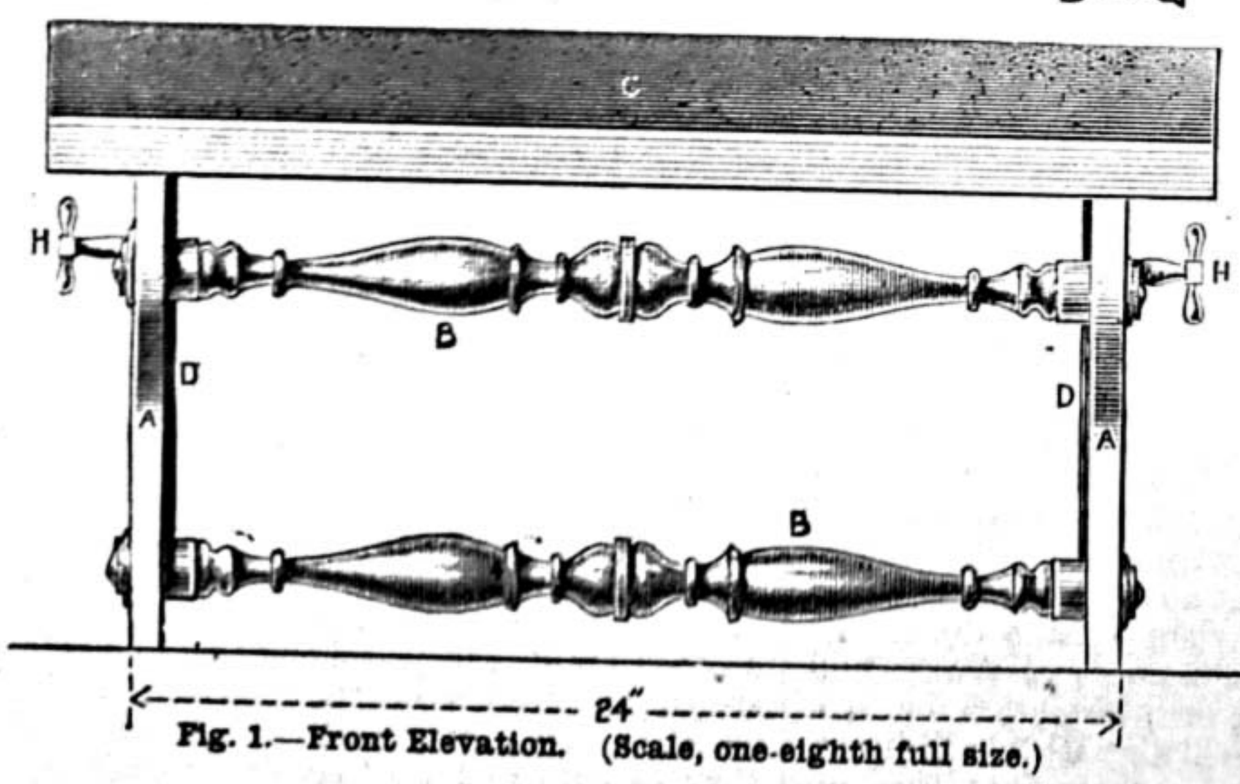

Fig. 1.—Front Elevation. (Scale, one-eighth full size.)

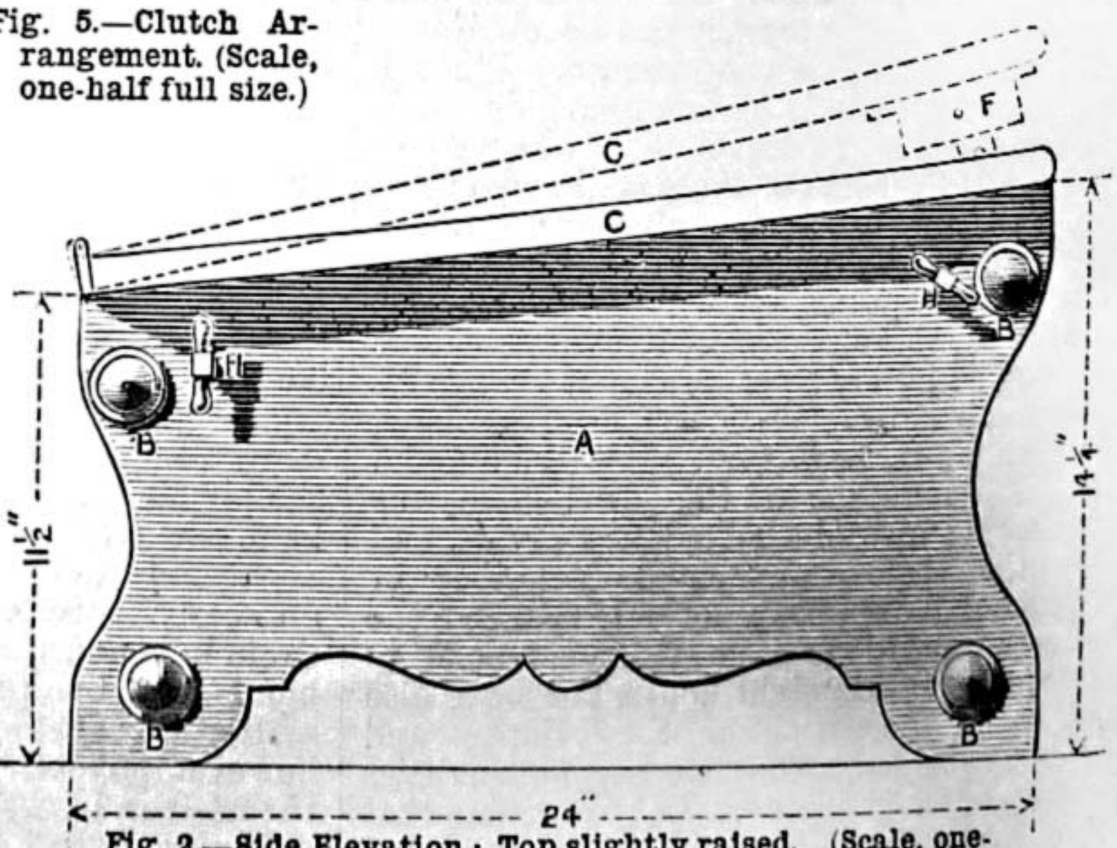

Fig. 2.—Side Elevation: Top slightly raised. (Scale, one-eighth full size.)

A ROLLER-BLIND INSTANTANEOUS SHUTTER.

BY W. E. D.

EVERYONE who has practised photography for any length of time has felt the need for an instantaneous shutter of some kind; and for detective or hand-camera work it is a *sine quâ non*.

The question then arises what sort of a shutter to use; and here let me say I do not believe there is a "best of all": one class of shutter is adapted for hand cameras, another for working with a stand; some will only go in one position, and others are too obtrusive, and nearly all are very expensive.

A simple and efficient shutter is shown in the article, "A Home-made Hand Camera," in WORK, Vol. II., page 281, but it cannot be used in an ordinary camera; and besides, if you have a lens with a large working aperture, it requires a wide space to work in; and again, a simple "drop" or "go and return" answers very well with the latter, but cannot be used with the former, when the whole box has sometimes to be turned to take a different way of the plate. After

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making some of nearly all sorts, I settled upon a blind shutter as being the best to use with both classes of camera, and which had the further recommendation of being cheaply and easily made, considering its efficiency, and the least noticed in a detective, as it can be made to work from behind the lens, the lens being fastened to the shutter itself, and the shutter sliding into the grooves of the rising front of the camera. I had better describe it first, so that the instructions for making may be more easily understood.

By referring to Fig. 1 you will see it looks like a small flat box, with the lens inserted in the middle of the top. The size is about 5 in. by 3½ in. by 1 in. Working inside between the two sides are rollers, one at the top and the other at the bottom (Fig. 2, *a* and *b*), having a piece of light-proof india-rubber cloth (Fig. 2, *k*), with a hole in the centre to make the exposure, fastened by the ends to the rollers; the top one has fixed to it a watch barrel (Fig. 2, *e*), containing a mainspring, one end of the spring being fast to the barrel and the other end to the spindle (*c*), which runs through and is held firm outside by a ratchet wheel (*d*): this is to allow you to wind the spring tighter, so as to make a quicker exposure, and to let it down again when needed, and thus secure different speeds. The bottom roller (*b*) has its spindle (*g*) fixed in the wood; one end has a thread cut on it, a round piece of brass (*h*), with two nicks for the trigger (*n*) to hold, being screwed on, and secured by a winged nut (*i*), which also answers for winding the blind on to the bottom roller, to set the shutter.

Now for the way to make it.

You will first require some ¼ in. mahogany—an old cigar box will answer all purposes if you are inclined to be economical. Cut one piece for the bottom, say 5 in. by 3¼ in. by ¼ in., then two pieces for the sides, 5 in. by 1 in. by ¼ in.; fasten the sides to the bottom with screws, so as to be easily removed when you want to insert the rollers; but it is as well to fix it first, so as to get the exact size for the rollers.

You must now procure the brass barrel (*e*) with the watch-spring in at a watchmaker's; they have very often second-hand ones, just as they come out of the watch. Do not get a stiff spring, or you will find a difficulty in making the shutter slow enough. By opening the box you will see that one end of the spring is fastened to the box, and the other end to a little piece of steel, called the arbor. This must be removed, as you will want to fasten this end of the spring to a spindle; for the spindle (*c*), take a good stout new skewer (a knitting needle is better, but much more difficult to work); solder on to this, about 1 in. from the end, a piece of brass, as nearly the size of the arbor as possible, drill a hole in the rim of the brass, solder a stout pin in, and bend into the form of a hook (Fig. 7). This goes through the hole in the free end of the spring.

The next thing is to turn up two rollers of wood, the same diameter as the brass barrel, and of a length to just work between the sides, say 2½ in., making one, however, ¼ in. shorter than the other; this is the top one, and allows for the brass barrel to be fastened on; make a hole through this (the top one), large enough for it to work freely on the spindle, pass this through the hole, and fasten the barrel containing the spring to the roller, by soldering two small pieces of brass with holes in one end to the barrel, and screwing them with very small screws to the roller (Fig. 2, *f*).

Now drive two pieces of stout wire (round French nails with the heads off will answer) into each end of the bottom roller, first cutting a screw on one (Fig. 2, *g*).

The next thing is to provide a blind. This must be of some material which will not allow the light to penetrate; for mine I used a piece of a lady's old waterproof (using a part where it was double), as being thin, yet strong, and impervious to light. Take a strip about 9 in. by 2 in. (or 2¼ in.); in the middle cut a hole 1 in. square (Fig. 2, *l*); glue thin narrow strips of wood, or cane, along the top and bottom of the hole, quite across the blind (Fig. 2, *r*, *r*); this will not interfere with the working, and will keep the blind from puckering when the strain of the spring is on. Fasten an end to each of the rollers, using glue and very small tacks; be careful that the tacks are not so long as to reach into the middle of the top roller, and thus touch the spindle, and prevent it working easily.

The rollers are now ready to pass through the sides. Mark the side at a proper distance from the bottom, so that when the spindle is passed through, and the blind wound upon the roller, it will just clear the bottom of the shutter.

Four small brass bearings must now be made, like Fig. 5, and screwed on the inside of the sides, for the spindles to work upon.

Glue a piece of velvet round the hole in

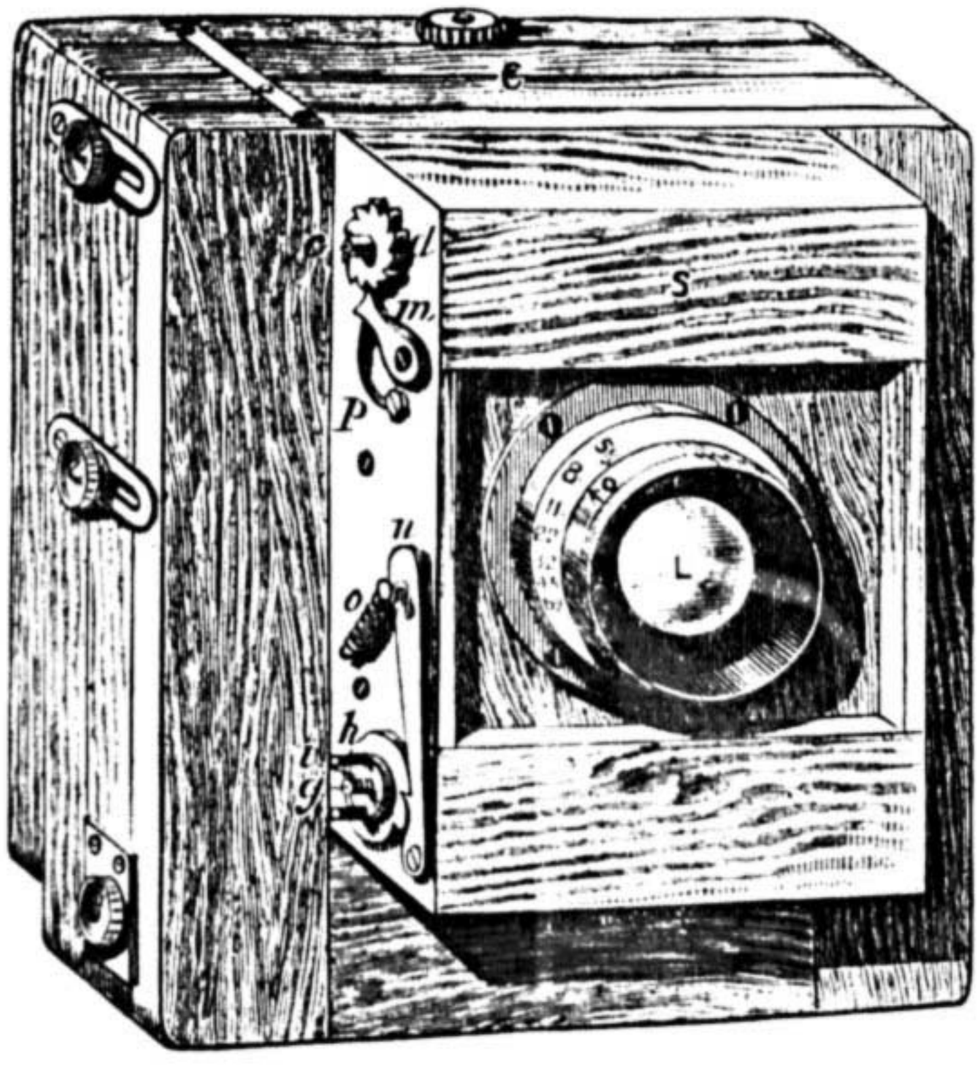

Fig. 1.

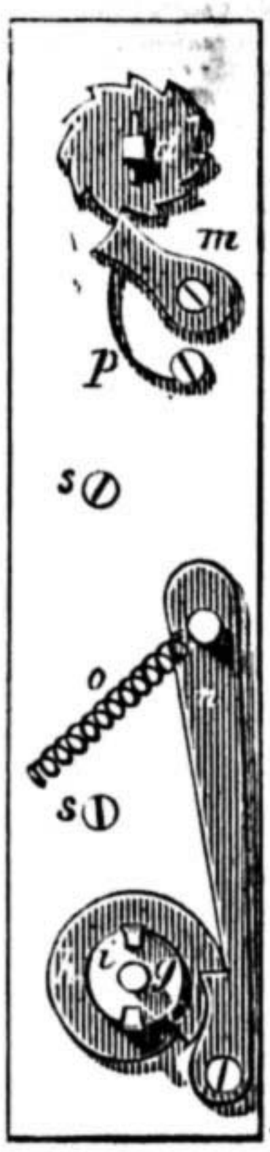

Fig. 3.

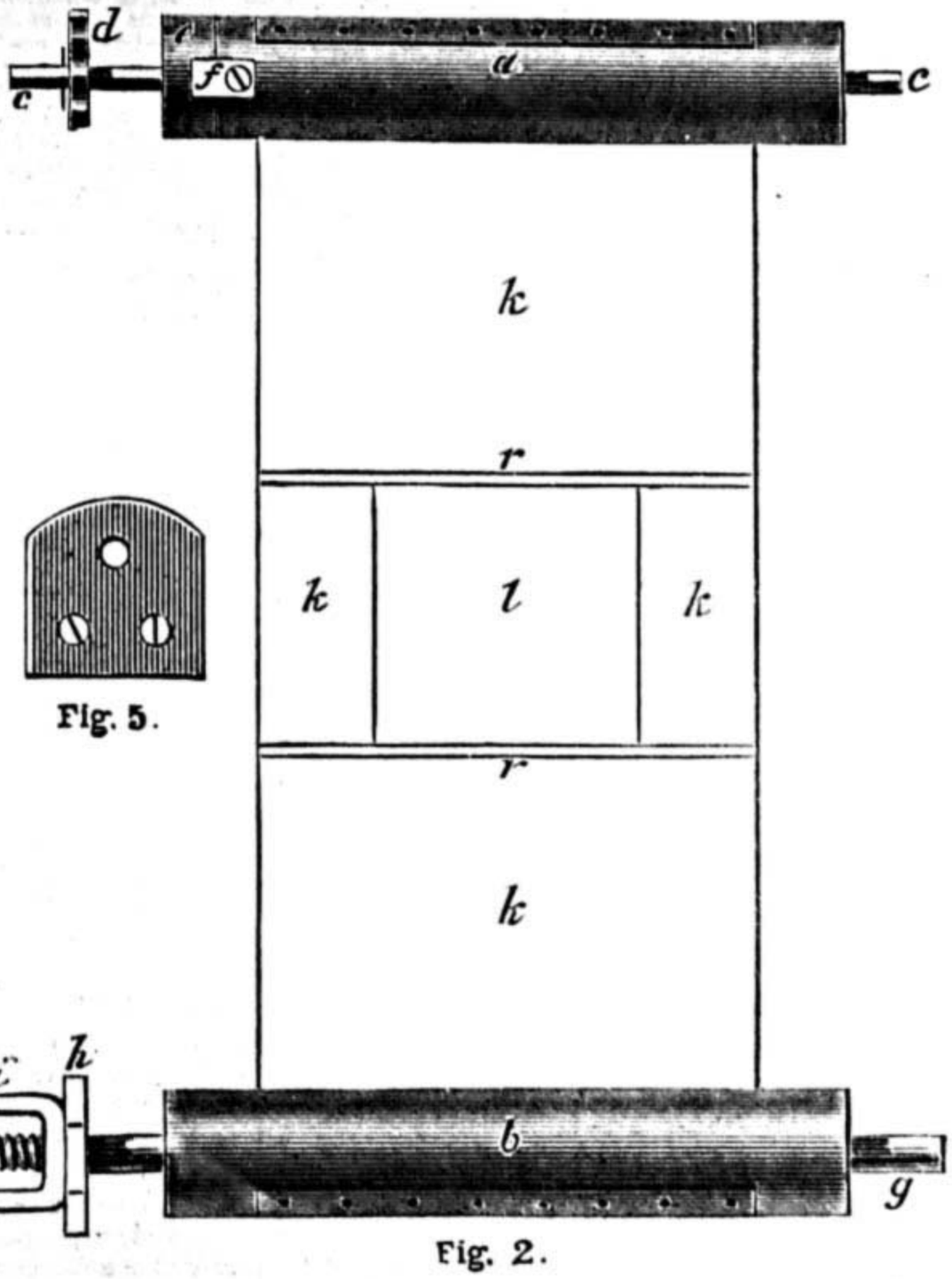

Fig. 2.

Fig. 5.

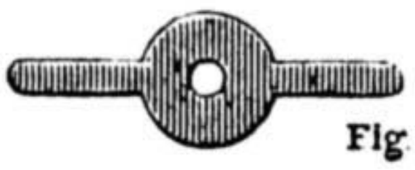

Fig. 6.

Fig. 4.

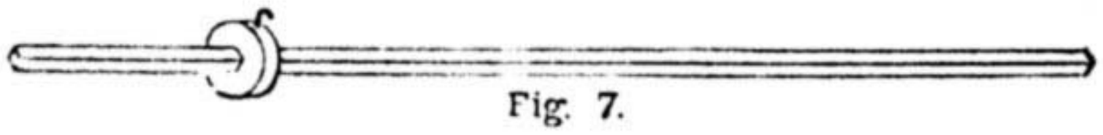

Fig. 7.

Fig. 1.—Shutter in Position on Camera, carrying Lens. Fig. 2.—Roller and Blind. Fig. 3.—Side of Shutter. Fig. 4.—Wheel with Nicks to hold the Blind down. Fig. 5.—Plate to carry Spindle. Fig. 6.—Shape of Brass for making Winged Nut. Fig. 7.—Spindle, showing Arbor and Hook. References to Letters in all Figs.—C, Camera; S, Shutter; L, Lens; *a*, Top Roller; *b*, Bottom Roller; *c*, Top Spindle; *d*, Ratchet Wheel; *e*, Barrel containing Spring; *f*, Pieces to fasten Barrel to Roller; *g*, Bottom Spindle; *h*, Wheel with Nicks; *i*, Winged Nut; *k*, Blind; *l*, Opening in Blind for exposure; *m*, Catch to hold Ratchet; *n*, Trigger; *o*, Spring; *p*, Spring of Catch; *r*, Thin Splines of Wood; *s*, Screws to fasten the Wood carrying the Lens.

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the bottom of the shutter; the blind will pass close over this, and so make it light-tight and secure.

We can now wind the blind on to either roller, but it will not come back of its own accord—this is because the top spindle goes round with the roller; it must be made fast before the spring can act. Square the end of the spindle, and make a ratchet wheel (*d*, Fig. 3) by cutting notches in a round piece of brass (it does not matter if it is not cut exactly true; all that is needed is that when the spring is wound up, it shall be held in that position); make a square hole in it to fit tightly on the spindle, and pass a pin through to prevent it coming off; a brass catch with a spring (Fig. 3, *m* and *p*) will keep it fast, and yet allow it to be wound up tighter when a shorter exposure is wanted.

The bottom roller must now be finished; a thread has already been cut upon one end of the spindle. Make a round piece of brass, and tap the centre to screw on the spindle (Fig. 4). When you have done this, wind the blind halfway on the bottom roller, so that the hole in the blind corresponds with the hole in the wood, mark the brass, and cut a nick so that the trigger may keep it in that position to allow the lens to be open for focussing; then wind the blind to its full extent, quite covering the lens, and make another nick; a winged nut is needed to lock this and keep it in its place, and also to wind up the blind to set the shutter (*i*, Figs. 2 and 3). Cut out of brass a piece the shape of Fig. 6, turn up the ends at right angles (this is like the winged nut on Lancaster's tripods), and tap the middle hole.

A trigger, the shape shown at *n*, Fig. 3, completes the brasswork, and a weak spiral spring made out of a thin piece of brass or steel wire (*o*, Fig. 3), or a rubber band, fastened to the trigger, makes it engage in the notches.

You must now decide where you will place the shutter: if on the hood of the lens itself, the back of the shutter has a piece of cork glued on, with a hole in it to fit the hood tightly, and the front and ends are boxed in with thin mahogany; but I prefer to use it as shown in Fig. 1—viz., immediately behind the lens. In this position I always think there is not so much danger of any vibration, and for detective work it is more out of the way, and not so noticeable; if you choose the latter plan, cut a piece of wood to carry the lens, let it down between the two sides as near to the blind as you can without preventing it working, and fasten with screws (*s*, Fig. 3), then enclose the ends and the rest of the front with thin mahogany; but before finally fixing, black all the inside with dead black; varnish or French polish the outside, and the shutter is finished.

The blind is first wound on the *top* roller as far as it will go, and the ratchet fixed by the catch; now when the blind is wound on to the *bottom* by means of the winged nut, the spring in the brass barrel is tightened, and when the trigger is released, it causes it to rapidly resume its place on the top, and the picture is taken when the openings coincide; to make it work faster, give two or three turns with a watch key just as you would wind a watch up, the top spindle being squared for that purpose.

The sizes given are for a Wray $\frac{5}{4}$ R.R. lens with $1\frac{1}{2}$ in. hood; if for a larger or smaller one, vary accordingly.

Some, perhaps, may not be able to make their own brasswork, or would prefer the better-looking articles made by professionals; these I would advise to write to Messrs. Watkinson & Lonsdale, New Briggate, Leeds, who advertise in WORK, and who have had experience in making shutters: I have their permission to say that they will undertake for the readers of WORK any article in brasswork if proper sizes and drawings are sent, which latter can be copied from the illustrations to this article. I am sure that those who send for brasswork will be well satisfied with what they get.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

118.—MANGNALL'S DOMESTIC GAS REGULATOR.

MR. JOHN MANGNALL, 40, Staveley Street, Harpurhey, Manchester, writes: — "Taking advantage of your public invitation in 'Guide to Good Things,' I submit for your criticism and notice a Gas Governor which I have designed for Mr. John Pollitt, engineer, 43, Lower Mosley Street, Manchester, who is the manufacturer of them. It consists of an ordinary valve cock, the valve of which is automatically related to its seat by its connection with a corrugated metallic diaphragm, upon which the pressure acts, causing the valve to open or close, according to the pressure exercised upon it by the gas, and thus regulating the supply. In principle it is identical with that used in the construction of the aneroid barometer and Schaffer's Steam Gauge, both of which have withstood the test of the last thirty years. In price it is very low, putting it within the reach of all gas consumers, however small, the prices ranging from 5s. 9d. for a $\frac{3}{8}$ in., or six-light supply, to 15s. for 1 in. supply, or forty lights, the intermediate sizes being $\frac{1}{2}$ in., or twelve lights, 7s. 6d., and $\frac{3}{4}$ in., or twenty-four lights, 11s. 3d. each. Erratic gas bills being so common, a few remarks may not be deemed out of place, as there are some who think checking the gas *before* it enters the meter has a special merit. This is erroneous, as the meter *cannot* record any consumption unless there is a passage of gas through it, and *all* meters are compelled to pass a Government test and be stamped as correct registers before they are allowed by law to be fixed. The cause generally lies in the gas companies supplying gas (which they are compelled to do to meet a fluctuating demand) at much higher pressure than it is economical to burn it. This necessarily forces the gas through the burners without giving a corresponding increase of light, and, consequently, a greater flow of gas passes through the burners than is efficiently utilised, and, as a matter of course, a higher register of the quantity passed through the meter. To correct this and deliver the gas at an uniform lower pressure at which the utmost economy of gas in relation to the gas consumed is secured, is the special function of a gas governor. I enclose a sketch, should you prefer to illustrate your notice of it." The question is, How does the "Domestic Gas Regulator" act when put to a practical test? At present, I do not gather that exists, except in design, and, as the proof of its utility lies altogether in its testing and the results obtained therefrom, anything further must be left until it has been made and tried. I am glad, however, that Mr. Mangnall has availed himself of my request to seek notice and criticism in the pages of WORK. I have called attention to it, but, manifestly, I cannot criticise it until I have had an opportunity of testing it, either personally, or by somebody else who is duly qualified to do so.

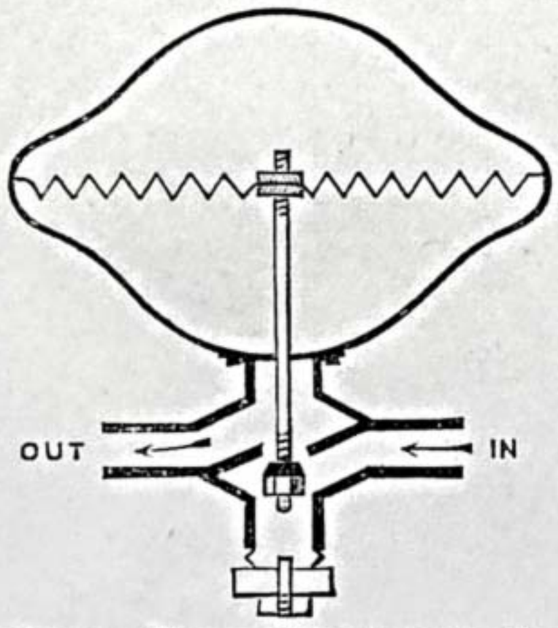

Fig. 1.—Mangnall's Domestic Gas Regulator.

119.—THE "GEM" PORTABLE SAW.

In page 506 of this Volume I described a folding saw known as "Stanley's Portable Saw." I have now to direct the attention of my readers to another tool of the same class, which is much stronger in its make, easily twisted up in the form of a coil, and very much cheaper. This saw appears likely to be of the utmost value to all those who have occasion to use a saw in woods, forests, etc., as, owing to its portability and extraordinary flexibility, it can be brought into action in many places and for many purposes in and for which an ordinary saw could not be conveniently worked. To surveyors, emigrants, miners, engineers, etc., its compactness will render it preferable to any other kind of saw. For felling trees it will be found to be most serviceable, as, by its aid, they can be cut level with the ground. Some idea of the saw itself and its adaptability for coiling up into a very small compass may be gathered from Fig. 2. Its peculiarity of construction is clearly shown in Fig. 3, from which it will be seen that the saw-teeth, which in form are very much like those of a rip-saw, are made of hardened steel plates, notched in twos and threes, and are put together throughout the length of the saw in regular alternation. The two-teeth plates are riveted to long narrow plates set lengthways, as shown, and through each end of these plates and each end of the three-teeth plates a loose rivet is placed, which forms a joint on which the adjacent plates turn. The saw is worked by cross handles slipped into rings, one at each end. The handles are withdrawn for packing. Ropes may be used instead of the handles for cutting branches of trees out of reach. The saw is 3 ft. 6 in. long, and 1 lb. in weight. It is made by a French firm (Messrs. Peugeot Brothers), and is supplied at 9s., post free, by Messrs. Moseley and Son, 323, High Holborn, W.C. When the advantages to be derived from the use of this saw are considered, it appears somewhat strange that it has not been thought of before, and equally singular that the idea should have suggested itself simultaneously to two makers, one in France and the other in England.

THE EDITOR.

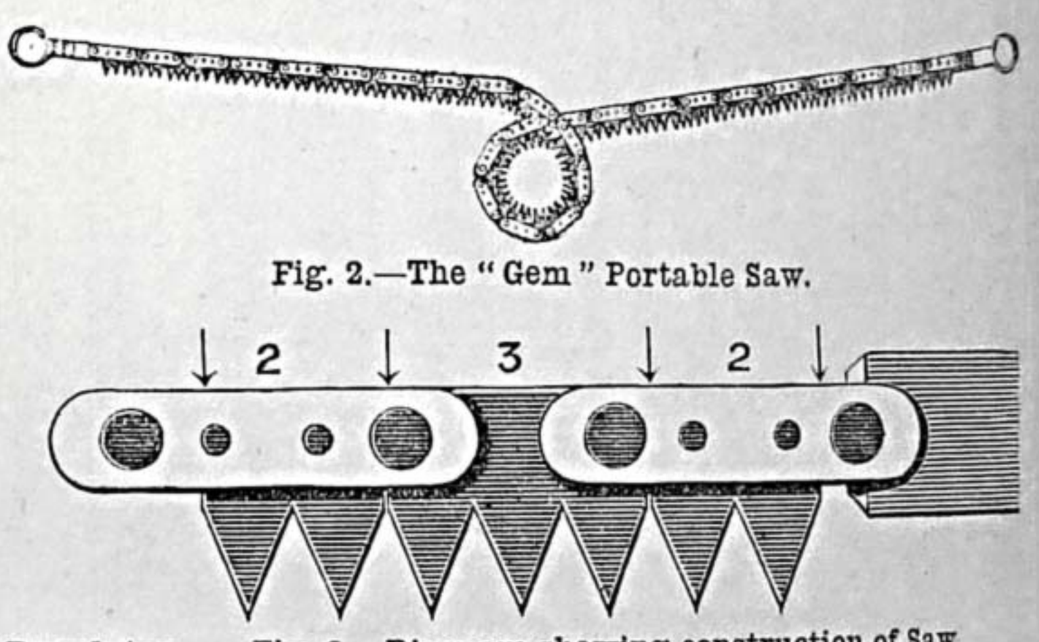

Fig. 2.—The "Gem" Portable Saw.

Fig. 3.—Diagram showing construction of Saw.

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SHOP:

A Corner for Those who Want to Talk It.

*** *In consequence of the great pressure upon the "Shop" columns of* Work, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of Work *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Fretting Banjo.—R. H. H. (*Shutter Oak*) writes in sequence to J. G. W. (*London, N.W.*) (see page 583, Vol. II.):—"If you will refer to my letter in Work for October 18th, you will see I referred to F. H. (*Streatham*), and not to you at all. J. G. W.'s system is quite correct, and I have re-fretted several banjos for friends in the same way. I also made a tool of two mahogany strips with needle points at ends, with a pin or pivot at the first division on one end, the whole being marked in nineteen equal divisions. I find the easiest way is to use a slide-rule, which gives the exact distance to set the compasses for each fret, instead of continuing to travel the compasses step by step up the finger-board till the exact eighteenth is found. I should have said, 'Grand Concert,' which is the one I possess; the vellum is 12 in. by 12½ in. over all."

Bent Hand Saw.—A. R. (*Scorrier*) writes:—"The following may be useful to carpenters and others who have an amount of work to do with the hand saw. When a saw gets bent, the carpenter often takes a block of wood and places the saw on the end grain and tries to straighten it with his hammer, but, to his astonishment, makes it worse than before. The mistake is that he goes the wrong way to work. Instead of a block, he should have placed the saw on an anvil, and have hammered it with a cross-faced hammer, as indicated by marks in the annexed sketch (Fig. 1). Then he should turn the saw and hammer on the other side at H H, toward

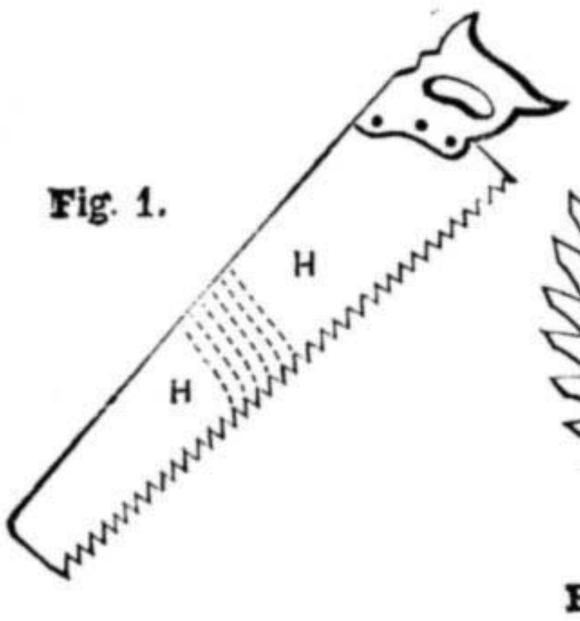

Fig. 1.

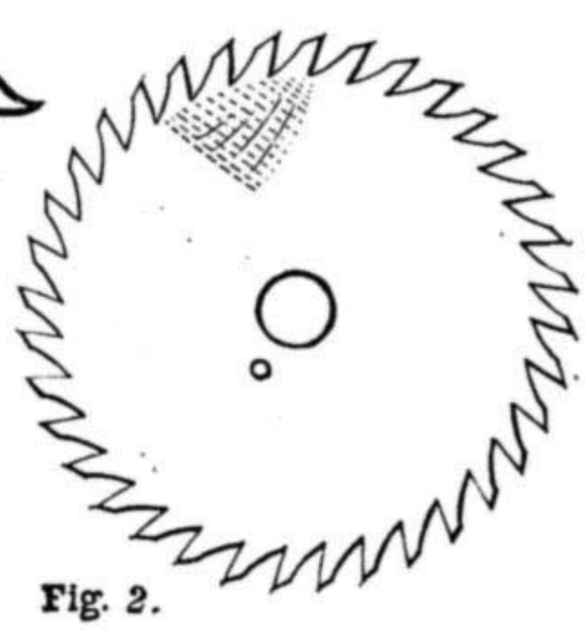

Fig. 2.

the heel and point, taking care not to strike very heavy blows, or he will make the saw a useless tool. I would like to add that in my reply to Sawyer (No. 87, page 568), in reference to hammering twisted circular saw, the hammer marks should be as shown in the annexed sketch (Fig. 2), and not in the position as given in the above number. Sawyer will please pardon me for not correcting mistake before."

II.—Questions Answered by Editor and Staff.

Polishing.—T. R. (*Plymouth*).—I am not acquainted with the minutiæ of the German methods of French polishing, but in the main the processes are much the same as ours. I quite agree with you that the polish on the German piano, etc., looks well at first, if you like even better than good English work, but have you compared the durability of the two? I think you will find that the foreign work in this respect is not in it, at least that is my experience, and I know the instruments made by the firms you name very well. The use of whiting as a filler is by no means new, in fact, it is one which I always recommend in preference to those which are largely composed of tallow. I do not know what to say about the use of sulphuric acid in conjunction with whiting, but I must say I am not favourably impressed with the idea. Possibly I may have mistaken your meaning, as your description of the process told you by your German friend is rather involved. As you say he was a tuner, and did not profess to know much about polishing, I am driven to the conclusion that he has misled you—doubtless, unintentionally—in his explanation of the process. I fancy that the thin liquid which is a transparent polish, but is not ordinary white polish, must be "glaze." Glad you find Work an assistance to you, and you may be sure that letters such as yours are always welcome.—D. D.

Magic Lantern and Transparencies.—Magic Lantern.—I will shortly place in the Editor's hand a brief paper on the lantern subject for his approval. With reference to transparencies for the lantern, if M. L. will turn to page 812, Vol. I. of Work, he will find his need met, as I have there described the method usually adopted by the profession.—O. B.

Crystoleum Painting.—W. A. H. (*Stockport*) writes:—"What is the advantage of having two glasses to paint on? I have a friend who paints a little himself, and he assures me that one is equally as good as two. I have noticed that the crystoleum paintings on the window of an artist's shop have a glassy appearance, while those of my friend's have not." W. A. H. supplies the answer to his own question. If one glass does as well as two, then why does not his friend's work look as well. It is needless to waste space in giving reasons why one glass is not so well as two. The fact is clear to all who have tried that there is a difference in favour of two glasses. If W. A. H.'s friend is pleased with his work, there is no reason why he should not pursue the course indicated. But that he can produce the same soft and delicate effects is impossible. By using two glasses, the body or opaque colours show through and blend with the transparent colours on the front. This, I think, of itself will constitute much of the charm of the picture. I have worked with two glasses, and know the result. I have not tried one glass, and should never think of producing good work by this means.—O. B.

Phonograph.—E. D. (*Royston*).—Have you two diaphragms, or only one, on your instrument? In Edison's there are two diaphragms and two points, the one gouge-shaped and the other fine, but blunt, somewhat ball-shaped. The composition of Edison's cylinders are equal parts of oleate and stearate of lead, with sufficient gum dammar to harden it. You might also try a compound of paraffin-wax and finely precipatated chalk. Your springs may be too strong, causing the needle to bear too much upon the cylinder. Try these dodges, and report if the results are better. The phonograph is such a delicate piece of mechanism that it is difficult to get the best results at all times.—W. D.

Electric Alarum.—W. P. S. (*Southwark Bridge Road*).—I cannot undertake to fit up an electric alarum, but if you like to give me more particulars concerning your clock, I shall be glad to help you through "Shop"—L. P. C.

Cylinder.—A Reader.—For single cylinder, about 7 in., double about 4½ in., boiler 14 in. or 15 in. diameter, speed perhaps four to five miles an hour, according to build.—J.

Graph.—W. J. T. (*Milnthorpe*).—The specimen you send has certainly not been printed on any of the gelatine or graph arrangements. It has apparently been produced by means of the cyclostyle, or some very similar appliance. I believe these are all covered by patents, so that you would not be at liberty to make without arrangements with the proprietors. In any case, unless you are prepared to lay down plant and incur considerable expense, it would be impossible for you to make as cheaply as you can buy. When things are made in large quantities they can be sold, even after allowing for the necessary profits of middle men, for less than it would cost to make only one or two by an amateur. If you want to get one, apply to any good stationer in any large town, or to W. J. Richardson & Co., 12 and 14, Queen Victoria Street, London, E.C.—D. A.

Picture-Frame Making.—Mytholmroyd.—The firm you refer to as advertising in our columns is of undoubted repute. If the communications you addressed to the firm in question were like the one you sent here, it is little wonder that you have received no replies. You should put your full name, address, and date, on every letter you write. On the one to us there is neither name, address, or date.

Easily Made Lathe.—Turner.—Why not send this through "Shop" for the benefit of all readers of Work?

Chip Carving.—H. T. W. B. (*West Bromwich*).—The first article on the above subject appeared in Work, No. 64, and the number can be had from the publishers, Messrs. Cassell & Co., post free for 1½d.

Book on Electro-Motors.—W. G. (*Falmouth*).—You may learn much by reading a little book by Messrs. Whittaker and Co., 2, White Hart Street, Paternoster Row, London, E.C. This treats of small electro-motors, and shows how they are made and used. The price is, I think, 2s. 6d.—G. E. B.

Screws.—A. H. (*Southport*).—External screws are cleaned more easily than internal ones. It is not considered difficult to chase screws by hand, but it requires practice, and a single object lesson will do you more service than a long description. The best material to practise on is a piece of box or other hard close-grained wood. The chasing tool is held barely touching the rest, in order that there shall be perfect freedom of manipulation. The lathe being slowly revolved, the tool is made to traverse the blank once or twice in a slightly curved direction before commencing the cutting, in order to get the strike or pitch of the screw. Then the first cut is made: a mere scratch on the surface. This is afterwards deepened, and finished by successive movements of the tool. After the first cut there is little difficulty, the path of the deepening cuts being guided by the first. The only difficulty then is to catch the threads right with the tool. The tool is slightly tilted on the rest, to stand radially with the work. If in striking the serrations of the tool do not correspond exactly at the termination of a single revolution, the screw becomes wavy or drunk, and is useless.—J.

Springs.—J. H. B. (*Bristol*).—You do not say what kind of springs—there are several kinds, some of which have already been noted in "Shop." Refer to the Index of Vol. I. of Work, price one penny.—J.

Pattern Drawings.—J. S. (*Barnet*).—Why not advertise in Work?—J.

Apprentice.—F. V. (*Manchester*).—It is not clear whether you want a full account of everything pertaining to apprenticeship or merely how to get yourself bound. To give the former is, of course, out of the question; and in regard to the latter, it may be said that you must first arrange with some employer who may be willing to take you on the general terms. The custom of the trade on which you intend to enter will probably regulate these to a certain extent.—D. D.

Polishing Organ.—H. C. T. (*Dulwich*).—Possibly simply varnishing your organ might improve its appearance sufficiently to suit you. As it has been painted, it will be quite beyond your power to ebonise it in the way pianos and other things are done. The nearest approach you can get to a good smoothly polished black surface will be by repainting carefully with ordinary paint, rubbing down after each coat is dry with fine emery-powder, and finally varnishing. Unless all this be very carefully and skilfully done, as good or better results will probably be got by simply using one or other of the enamel paints, such as Aspinall's or the Foochow enamel. Gold decoration will look very well if in moderation and properly done.—D. D.

Chair Seats.—Britannia.—These are obtainable from J. C. Plimpton & Co., 65, Victoria Street, Liverpool, or from almost any good wholesale furniture factor. Prices vary, and must be arranged with vendor.—D. D.

Black Surface.—Overmantel.—Japan black is not suitable for your overmantel if you have any regard for its appearance, though of course you may use it. The best way will be to French polish. First stain the job black, and then polish in the usual way, using black polish. This can easily be made by mixing ordinary polish with gas-black. Polish the whole of the job; never mind the places which you intend to gild, as the black will not show through the gold. When the polishing is finished it will be time enough to attend to the gilding. This you ought to do with real gold-leaf if you want it to last. Do not polish over the gilding. None of the gilding powders or bronze paints keep their colour equal to gold, though some of them are tolerably durable, especially if they are protected from the action of the atmosphere by a coat of varnish.—D. D.

Grandfather Clocks.—M. L. (*Rochdale*).—For grandfather clock movements and dials, try Potts and Sons, Leeds; Gillett, Bland & Co., Croydon; or J. Smith, Clerkenwell, or Evans, Birmingham—that is, for new work. If old works, try at sales or auctions, where they may often be picked up cheap. If you mean wheels or parts new, or for repairs, try J. Mayes, 55, Red Lion Street, Clerkenwell, E.C., who makes a speciality of wheel cutting.—A. B. C.

Quarter-H.P. Steam Engine.—W. M. (*Hingham*).—The dimensions of the engine you ask for are: cylinder, 2 in. diameter, 4½ in. stroke, fly-wheel, 16 in. diameter, speed 120 revolutions, pressure 50 lbs. per square in. The boiler I have not dealt with, and scarcely think any but a boiler-maker should undertake to make it; it should be at least half-h.p. You will require a good lathe to make the engine, say a 5 in. sliding and screw-cutting lathe; and, if you want something to go on with, you might be going on with the boiler, or getting your workshop and tools in order. I think the simplest and cheapest way to manage the boiler would be to have a cylindrical boiler set in bricks in a fireplace, the fire-stove being taken out; this would take a good while to get up steam—perhaps fifty minutes; another way would be to have a simple vertical boiler which would be low enough to stand under the chimney; this might raise steam in thirty minutes, and a single cross-tube would make it quicker and add to its efficiency. I would rather some other contributor should take up the boiler.—F. A. M.

Carpentering Classes.—Thisbe.—For particulars as to Carpentry classes, apply to the Secretary of the City Guilds and Technical Institute, Finsbury, London, E.C.

"Work" Exhibition Catalogue.—The published price of this catalogue is twopence. If you still want one, apply to Messrs. Cassell & Co., London, E.C. Submit any likely MS. you desire, on approval.

Printing Press.—R. J. H. (*Penzance*).—You should advertise your press in the "Sale and Exchange" column of Work. Amateur will then, doubtless, see your advertisement.

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Waggon Building. — RAINFORD. — Your aim should be to please your customer as to size, shape, and weight. I advise you to select a good waggon in the neighbourhood, and if it suits your client, take the size and style of the body, and arrange to make any slight alterations you may agree about. Make the frame of two sides and two summers, a hind ear-bed morticed on, and a front ditto notched down on to the top about half an inch; also a centre ear-bed, which must be notched upwards on the underneath of the two sides and summers. The hind and centre ear-beds must be long enough to take iron shore-stays or "knees," to support the sides; the front one, not taking shore-stays, must not be so long. Fasten the front and hind ear-beds at the corners with $\frac{7}{16}$ in. "boss"-headed bolts. The centre one may also be bolted to the summers in a similar manner, but not to the sides, as they are secured by iron standards, as you will see presently. You will next require the blacksmith's help. Get him to make at least seven iron standards: one for each corner, two for the centre ear-bed, and one for the centre of the front. The bottom ends of these standards will vary in length, but the ends must all be threaded and fitted with nuts, as must also the top ends of all of them. The bottom ends of the four corner standards should be bent like Figs. 1 and 2, to facilitate repairs when the ear-beds require renewing. The other three will be straight like Fig. 3, and they will all be tapered from $\frac{3}{4}$ in. round at the shoulders to $\frac{7}{16}$ in. round at the top. When these are ready, fix them in their places, and give them the amount of "splay" necessary

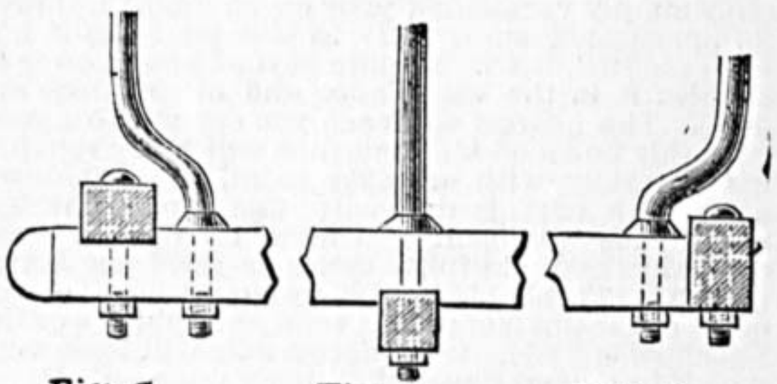


Fig. 1. Fig. 3. Fig. 2.

Fig. 4.

Waggon Standards and Stay.

to suit the waggon you may decide to make. Next prepare your raves, mark them on, and bore holes in them to fit your iron standards, and drive them on in their places. Mine has three raves in each side, thus giving a deep panel at bottom and two narrow ones on top of that; there was also an outrave, making four in all. However many raves you decide on having, fix them all (except the outrave, of course). Cut some small pieces of $\frac{3}{4}$ in. deal in lengths to correspond to the various widths you intend to have your panels, and place them in position temporarily behind your standards; screw up the top ends of the latter, and you will thus have your framework rigid for marking the pins. Get sufficient mild Bessemer steel $\frac{3}{8}$ in. round rods for the pins; they will not bend like iron, and will cost very little more. If you prefer the iron, it should be $\frac{1}{2}$ in. round. Set out your pins on the outsides of your framework top and bottom with your compasses, and mark them distinctly on the face of all your raves, etc., with a straight-edge, and pencil ready for boring. Be careful about this, as unless your pins are all "splayed" in continuous order, the finished waggon can never look well. Next mark all your shore-stays, outrave stays, and other irons, so as to guide you in "shaving" when you come to that part. Cut off all the steel pins to their right lengths, and lay them in consecutive order in some safe place where they will not get mixed. They should not go through the top rave by $\frac{1}{4}$ of an inch, nor through the side by the same amount, but if your waggon is to be deep, you may allow two on each side sufficiently long to take a nut on each end, and place them midway between the iron standards to keep your top raves down. Your panels will require fastening to these pins by staples made of thin hoop $\frac{1}{2}$ in. wide, each fixed with two boss-head wood screws. If you put alternately two staples on one pin and one on the next, it has a nice effect. Scollop the top edge of top panel between each pin, to make it look lighter. We have next to consider the under parts. I certainly would make it lock in its own length by allowing the front wheels to run underneath the body. That being so, you must fasten the hind axle-bed and riser (or risers, if more than one is necessary) to the body by four long bolts down through the lot, and two iron stays like Fig. 4 in lieu of clasps to keep the axle steady. Remember to fix the hind axle midway between the centre and hind ear-beds. You will require two wheel-plates for the front carriages, and unless your smith is used to making them, you will get them cheaper from a coach ironmonger. Fix the top wheel-plate on a stout centre bolster, and two pieces the same depth as the bolster, but not nearly so stout, for the front and hind edges to rest on. These may be shaved to look very light without making them necessarily weak. The same remark applies to the bottom carriage also. Allow your two bolster plates, through which the perch pin works, to be each $\frac{1}{8}$ of an inch thicker than the wheel-plates, or your waggon will be hard to "lock" when loaded. Fasten your bolster-plates with bolts, or they will work loose. One word of caution, which also shows the need of always seeing your job finished before you begin it. It is this: your centre ear-bed and your front bolster must be so relatively fixed that the wheel does not strike against the former when run underneath the body of the waggon in locking. If you provide a skid for the hind wheel, let it be drawn from a chain fastened to the perch pin, between the top of the axle-bed and the riser above it; it draws easier for the horses, and does not strain the body. I certainly would draw a plan and elevation of one side and front and rear, setting out all the sizes, before I commenced work. However rough it may be, it would save time, temper, and probably material.—J. P. S.

Gas Engine.—F. B. (*Harkefield*).—It is impossible to point out the fault of the engine without making an examination, or having a very full description of its behaviour. There must be something very peculiar to cause its action to vary on different days. You should write to the makers.—F. C.

Picture Framing.—J. M. (*Stoke*) does not explain his method, so I cannot help him to improve his style of manufacture. Does he use the shooting-block and plane, which removes any roughness that saw leaves? Booth's mitre cutting machine is simple and effective for smooth joints.—J. R.

"Hearts of Oak" Emblem Frame.—H. S. (*East Knoyle*).—Design mostly used is a beaded edge, as in figures. I have found either of these designs very good and economical. H. S. can get a variety ready made at any frame maker's at a very low price—much cheaper than an amateur can possibly make them, considering the hard nature of the wood. If he wants designs in carving, oak leaves or a rope pattern I should suggest as suited for his subject. I framed mine some time back and bought a very

Fig. 1.

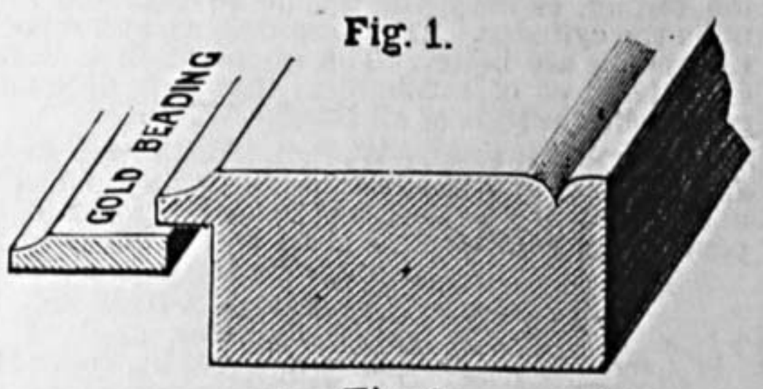


Fig. 2.

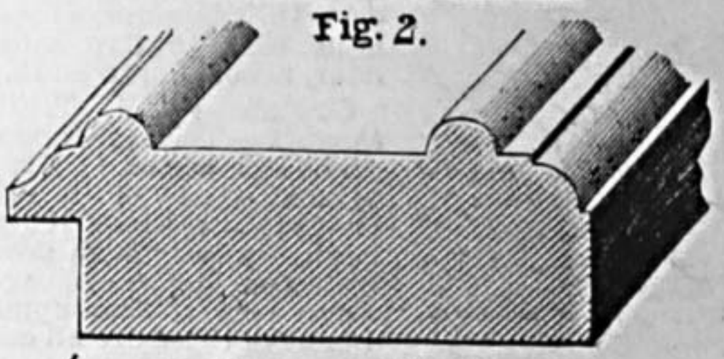
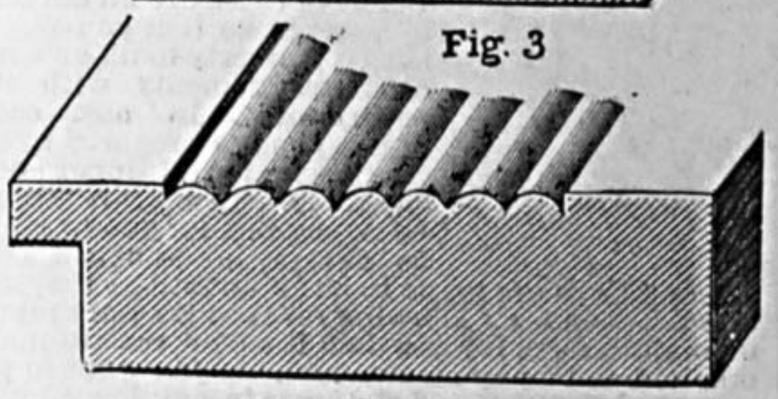


Fig. 3



Frame Mouldings.

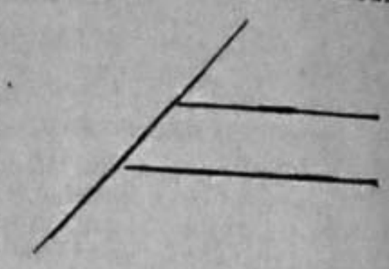
beautiful carved solid oak 2½ in. wide, 6d. per foot, and 1 in. washable gold flat, 1½d. per foot. If H. S. thinks he would like the same, I will try and find the address if he communicates with the Editor of WORK.—G. R.

Book on Preserves.—F. S. (*London, E.C.*).—The "Royal Confectioner," by Francatelli (Chapman and Hall), may suit you. Most of the subjects mentioned are treated in "Cassell's Dictionary of Cookery," price 7s. 6d.

Spelter.—T. D. B. (*Bury*).—You are mistaken in your application of the word spelter; there is no such thing as spelter lead. In the market quotations you see spelter at so much per ton, that means zinc, that being the name that that metal is known by commercially. Another kind of spelter is the ordinary hard or brass solder used for brazing. I have never seen any special quotation of price for tea lead, and I should imagine it would be the same price as any other kind—say, about £15 per ton on an average.—R. A.

Patent—Extension of Protection.—P. M. M. (*Glasgow*) can get a month's extension of time—ten months instead of nine. The form (Form U) costs at the Post-Office £2. We advise P. M. M. to combine some slight improvement with his invention, and apply for protection *de novo*, using Form A, which will cost him £1; and he will proceed in the manner directed in our article to which he alludes.—C. C. C.

Mounting Prints.—FITZHUGH.—Cut your print down within 1 in. of the actual plate—sponge with clean water the back of same print, then paste about ½ in. of margin (back), and lay same on a good stout board; then cut an eight sheet Whatman board with an opening to show the print, but be sure to cut it on the level, and be careful that it is cut to show just the "sight" of the print, margin 2½ in. Woolley's, of Holborn, will send you their list of prices for boards. The best back is, of course, a panelled strainer, but for "Graphic" prints I would advise strained brown paper.—F. B.



Clock Cleaning.—LEROY.—You have bent a pivot of one of the wheels in putting the clock together, or you might have bent a tooth in one of the wheels, or one or other of the wheels is bound between the plates; or again, through age or bad thick oil, the mainspring may not be working as it should. Take the clock to pieces, and examine all pivots and teeth; if any are bent, put them straight, only be careful they do not come off; take off the covers of the barrels and the mainsprings out by taking hold of the inside coil and gently pull it up, but hold it tight, also the barrel. Clean the spring nicely with a little benzoline on a rag, and clean out the barrel; also the arbor that goes through, and the holes in barrels and covers; replace spring, by putting the outer end of it in the barrel and on the hook, then bend it round, and press it in till back in its place again; then put a little oil to the springs and on the bottom of barrels, also covers and the pivots of the arbors; put your clock together again, and try now. Before putting the pallets back, see if they are worn where the 'scape wheel works; if so, drive the pallets up the square a little distance, so that they shall work on a fresh place. Then put them in their place and see if the tooth of 'scape wheel seems to fall a good distance when dropping off one pallet on to the next; if so, put the pallets deeper in towards the 'scape wheel by turning the movable disc that the pivot of the pallets works in. In the front plate, you will see a saw mark so—like a screw head, and the hole is near the edge, on purpose to regulate the depth of the escapement; put it as deep as it will go without catching on the tops of the teeth; its being worn or too shallow will account for its gaining, as you say. Do not alter the pendulum by making it lighter; I believe in heavy pendulums. If the clock does not go after following the above instructions, it may be some of the pinions being worn from bad depths and old age, or because some of the pivots or holes are worn and want replacing. Regarding the pallets for the Grandfather—do you mean that it does not tick level, and is not in beat? If so, bend the bottom of crutch—the part that carries the pendulum—to the right or left till it ticks level. I do not quite understand what you mean about this clock. The best book is "Britten's Watch and Clockmakers' Handbook, Dictionary, and Guide," price 5s.; order it from Grimshaw & Baxter, 35, Goswell Road, Clerkenwell. I forgot to say that perhaps the springs may, through age, be cramped. When out of the barrels, and free, they should be about 6 in. diameter; if much smaller than this, have new ones fitted, price about 1s. 9d. each.—A. B. C.

Oboe Reeds.—R. L. H. (*Glasgow*).—Professional reed makers employ no solution to give a moisture-resisting surface to the reeds. In good reeds by the best makers, it will be observed that the natural surface of the cane in the centre of the reed is left untouched quite high up towards the top, as shown in our illustration. This gives a sort of ridge or backbone to the reed which strengthens it and helps to preserve its form. For scraping down, a piece of sharp-edged glass or Dutch rush will be found most useful, and the finishing process is best accomplished by the very finest glass-paper. A special tool is used by oboe reed makers for cutting the hole in cork which receives the staple. It is formed of two pieces of brass or steel (preferably steel) tube, one inside the other with sharpened edges. Another method is to use one tube with cutting-edge to cut the hole in the cork. (The tool must be wetted from time to time to make a clean cut.) Then fix the cork on the staple and turn it down to the required thickness in a lathe. In order to flatten an oboe which is sharp, it is better to put a little longer cane.—H. R. G.

Oboe Reed.

Polish.—G. H. W. (*Bilston*).—The polishing of pine is done in the same way as other woods, with the exception that the article should be sized instead of being rubbed with filling. The size, of course, answers the same purpose. If the size has raised the grain more than you care to see, as is almost certain to be the case, smooth down with the finest glass-paper, or even with a coarse, harsh bit of canvas, before applying the polish. If the wood is to be stained, do so before sizing.—D. D.

List.—You ask for "a good retail price list for bookbinding (forwarding), or refer me to some firm." Now I cannot tell whether you want a price list for tools and appliances, or for charging work done.—G. C.

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Press Bed.—SERGEANT.—A press bed, to accommodate two persons, and to stand about the height of a chest of drawers when closed, is made as follows. Let it be 15 in. from the ground. Two morticed and tenoned frames are hinged at A (Fig. 1), and the front frame folds underneath the back one. On no account have the front frame to fold over the back one. The further end of the back frame should be hinged to a fixed board in the bottom of the chest (Figs. 2 and 3). At that part—the head—it will be advisable to have two long boards and two small ones joined, as in Figs. 2 and 3, in order that pillows, etc., may be placed against them. I will not occupy space in explaining my reasons for showing these boards with the intention

Fig. 5.

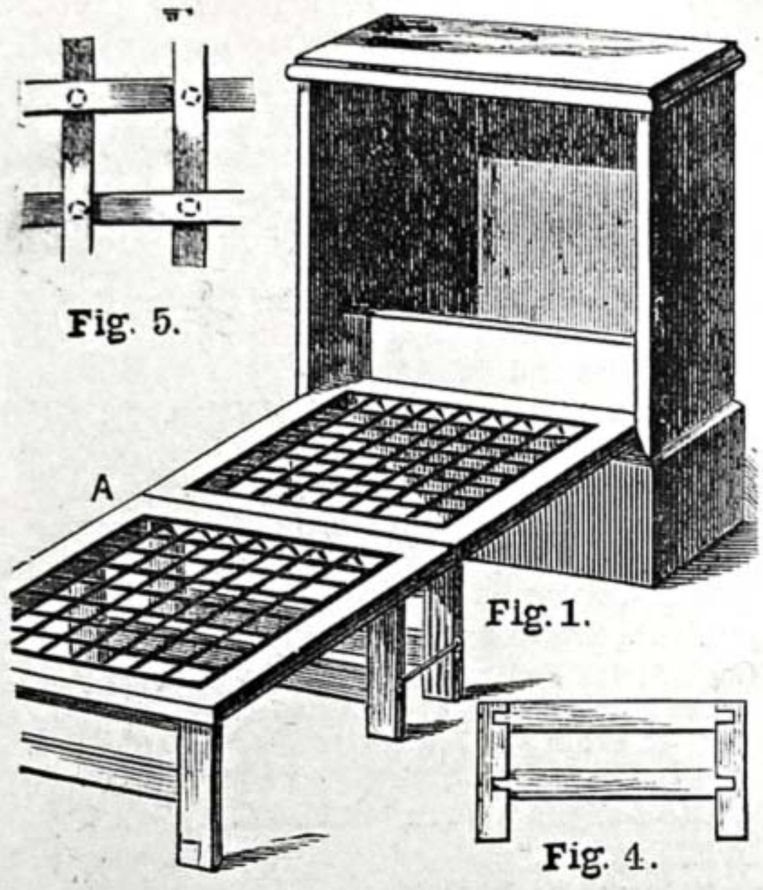


Fig. 1.

Fig. 4.

Fig. 2.

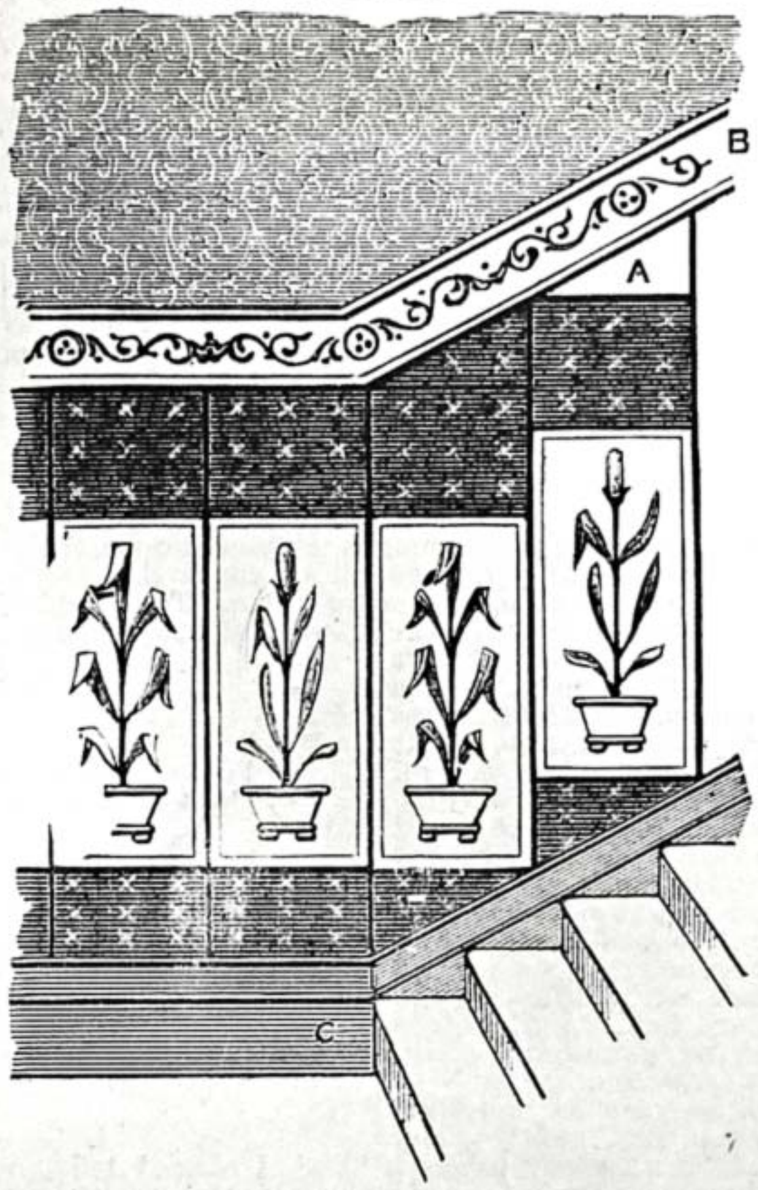
Fig. 3.

Press Bed. Fig. 1.—Bed Frames unfolded. (It is intended that Chest shall have two Doors, but they are not shown in Sketch, in order that the latter may be clear.) Figs. 2 and 3.—Side Elevations, showing the Frames folded inside Chest, and being unfolded respectively. Fig. 4.—A Frame Support. Fig. 5.—Method of weaving and stitching Webbing to receive Bed, etc.

of accommodating the head here in preference to reposing far back in the interior of the chest. Three upright frames (Fig. 4) will be necessary to support bed. They should be either hinged or pivoted (preferably the latter) between the side rails of bed frames, in the positions shown in Fig. 1. They could then be folded flush with these frames. To keep them firm, a hook or pin at each end of the middle pair will suffice; and a flush or other bolt at the bottom of the remaining one, entering a small hole in the flooring, will keep that one firm. Other means, however, can replace the latter course. Across the frames secure wide strips of webbing, by passing each strip over and under those which it comes in contact with (Fig. 5), and tacking the ends to the wood; also stitching all pieces at their junctions. Suitable dimensions are:—Width of each large frame, 3 ft. 3 in; length, 4 ft. 3 in.; width of the rails composing them, 3 in., thickness, 1 in.; height of chest, 4 ft. 6 in.; thickness of sides, 1 in. If the supporting frames are not strong enough, have either four or six turned legs to screw into the under surface of the large frames, allowing them to be removable at pleasure.—J. S.

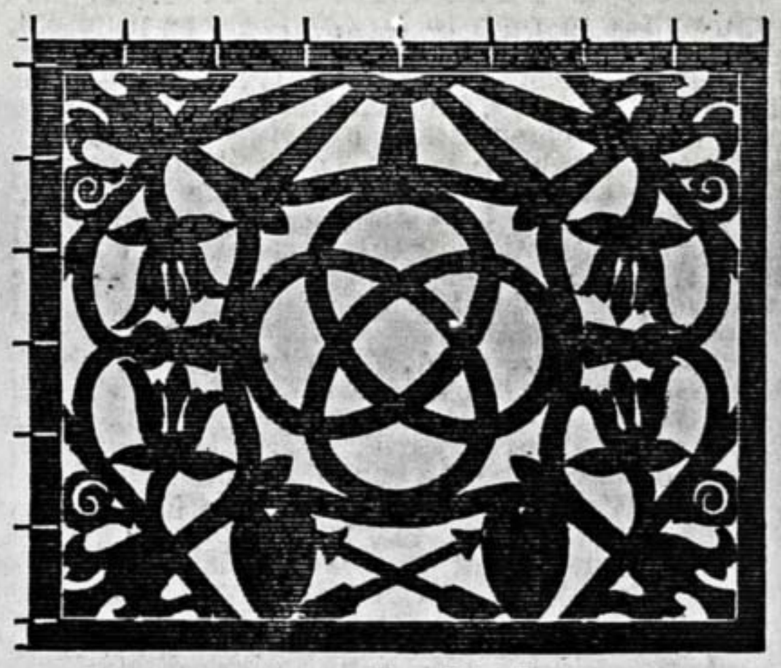
Vending a Patented Article Made Abroad.—T. D. G. (*Ilminster*) asks:—"If a patent is taken out in England only for an article, can that identical thing be made in any other country and sold, and used in England with impunity?"—[Certainly not. If the sale of such pirated articles in our country were legal, it is obvious that the protection offered by our patent laws would virtually be worthless.—C. C. C.]

Wall Dado.—W. N. (*Wood Green*).—I take your note to refer to a panelled dado when hung on the staircase rake. These designs are usually made: two panels to the width of paper, and having a plainer diapered space above and below the panels. For the level landings, etc., the panels are hung in pairs as printed, but for the rake—the top chalk line, of course, being set out to work by—the paper is split up into single panels, and the top piece of waste fitted in at the bottom vacant spot, or *vice versâ* (see sketch). The dado border is put on after both dado and filling are fixed. If for varnishing, all must be butted.—F. P.



Wall Dado.

Fretwork Panel for Spoon Box.—NEMO.—The neat sketch on your letter requesting a panel with lover's knot in the centre is hardly correct. Obtain the catalogues of fretwork firms who advertise in WORK, in the event of this design not



Spoon Box Panel.

meeting your taste. I have drawn it proportionately to your measurements; therefore you can easily reproduce it full size by the "squaring" methods described by myself and others several times. The space between each pair of short lines at the side and top represents an inch; therefore, if NEMO will draw lines straight across sketch, taking these short lines as starting points, he will have little difficulty in reproducing it full size.—J. S.

Walking-Stick Air Gun.—ZERO AND R. G. (*Preston*).—Both these readers wish to make walking-stick air guns. The subjoined sketches of an air gun and condensing syringe of the best and most approved make and efficient action will aid description. The gun is in two parts, screwed together in the middle of the barrel's length, marked A in Fig. 1. The handle, H, screws off to receive a light gun-stock for shoulder holding, if desired. A ferrule-cap, P, screws over the muzzle to protect it when used for walking. It weighs, without stock, about 1½ lbs. The size of the stock is 1 in. at the handle, and ¾ in. at the muzzle; the bore of the barrels is $\frac{3}{16}$ in. for the bullet, and a little more for the air barrel. The air charge is contained in the part marked B to the joint A. The charge of bullet or shot may be put into the muzzle and rammed in, or at the breech marked X, opened and closed by a small projecting knob at that part. The trigger is kept flush with the stick surface, and can only be got out for use by a square key, to be carried in the pocket. This is pressed against a flush stud close to the trigger stud, and when inserted, turned enough to force out the trigger stud ⅛ of an inch. The finger pressure on this releases a portion of the air in the chamber B, and the charge, if a bullet $\frac{3}{16}$ in. diameter, is impelled with force enough to kill a rabbit at forty yards, and so on successively as the bullets are dropped into the breech-hole, and the breech bolted by turning down the knob and pressing the trigger. Of course, the final discharges by air pressure are not so powerful as the first ones, but still effective for less distances. Shot may be used in prepared cartridges, or by a first wad of felt being rammed in; then the shot, and another wad to retain them in the barrel. But air is not effective in sending shot far. A special barrel is fitted in the stick, and the bullet barrel taken away to admit the charge when wanted. Any postmaster will tell you if you need a licence to carry an air gun when away from your own house. The condensing syringe is about 12 in. long, with a T-piece at one end, E, to put the feet on to hold it while charging the barrel with air. To do this, the syringe is screwed on to the part B that has been unscrewed from the breech, or forward part of the barrel or stick. The charging is simply working the barrel up and down the piston of the syringe, driving the air into the air-chamber of gun B. The greater the strength of the operator, the more the air is compressed, and the more efficient action on the bullet at each explosion—or expulsion, rather. The gun shows an exposed section, S. This is the spring and valve, which keep in the air till the trigger action, by forcing it back, allows a charge of air to escape by each touch of the trigger operating on the spring to force open the valve. There are not at present any air guns which supply a continuous flow of bullets to meet the incessant touches of a trigger, as in some magazine guns. The correspondents will realise the fact that these guns require critically exact working appliances to bore the barrels; cut the joint-thread or screw that unites them, bore the breech hole trigger-holes, make and adjust the coil-spring, and fit air-valves. Defective work means failure, and often that failure may be due to so slight a deviation from exactness as not to be perceptible except to an expert. From a long experience of shop exigencies, I have found it ensure success and to be an immense gain of time, saving needless worry, to buy as a model a gun, instrument, carriage, etc., whichever I desired to imitate—for it is imitation by guess-work to do without a model. Having made my hobby, perhaps with some improvements, I sell my model. If a gun, I use my own make: that spares me conscientious doubts about results to other users had I sold it instead of my model. Your correspondents having tried and doubtless succeeded by this description in making an air gun walking-stick, will find they have at the same time acquired a large fund of technical knowledge of lathe working and spring forging, hardening and tempering, which will be available for other high-class work, for what they aspire to make is just the delicate piece of mechanism which will teach perseverance and some of the most skilful operations in lathe work and fitting. It is the work of at least four skilled men, each masters of their craft; but this need not discourage an amateur if he has the time, the tools, and the talent. To help him, I urge this advice, as I do to all learners: do not try to do it all under your own hat, which means hugger-mugger messing and final disappointment, not from the want of time and perseverance, but from doubt of which is the right way, and working with the untrained touch in handling tools. A model serves for a standard of excellence. As ZERO asks for a maker's name and address, it seems as if he had the right idea of how to go to work to avoid failing "under his own hat," and yet make a working gun. Air guns are a speciality of a large London firm, which sells air guns of every description, from £2 15s. to £4 10s., including condensing syringe.—J. C. K.

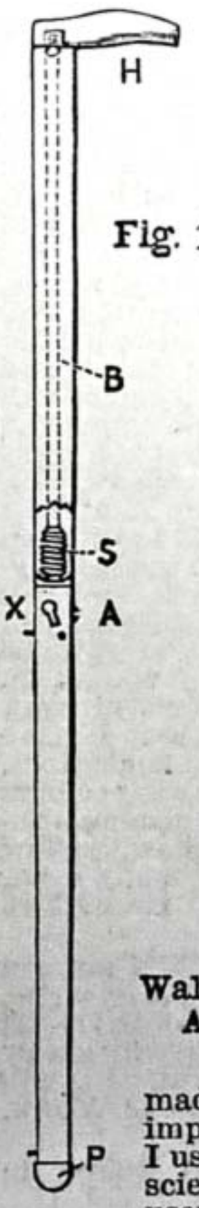


Fig. 1.

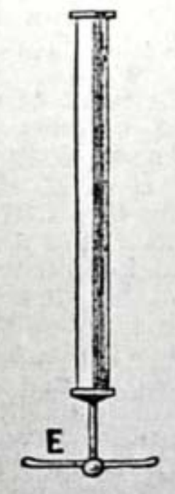


Fig. 2.

Walking-Stick Air Gun.

Bench.—T. H. W. M. (*Bolton*).—There have been descriptions of benches in recent numbers of WORK (see No. 92, page 647), either of which would do for boys' use, if only the height is modified according to the stature of the boys using the bench. To ascertain this, let the boy plane a piece of wood of ordinary thickness, using a jack-plane in the usual way; the boy ought to be able to place his arm from wrist to elbow in a horizontal position, without stooping or obvious reaching upwards. A bench which is too high may cause the inexperienced a blow on the elbow; but a too low bench is bad, as it causes a stooping attitude (see No. 50). Avoid any iron stops or anything of iron in exposed positions, or the teacher will have a quantity of unnecessary grinding and sharpening to do.—B. A. B.

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IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Boot Making.—W. G. writes, in answer to THE LAST THAT SHALL BE FIRST (see page 650, Vol. II):—"I must first say that the initial 'M' was a misprint, it should have been 'W. G': and next that it would be impossible to answer all the questions asked in 'every particular and detail' in 'Shop.' You want to know how to make a pair of boots, from beginning to end: you must wait for articles on these. I would advise you to try your hand as much as possible at repairing, so as to get used to holding the tools, and the easiest way to hold your work. This, when you go to make a pair of boots right out, will all tend to make you more contented with the result. In my answer to M. M., I did not explain the meaning of shanked, skived, seats, lefts, and split-lefts, because those questions were not asked, but to properly answer M. M.'s question, 'How to make a sewn seat,' I was obliged to use those terms."—W. G.

Glass Cement.—MIEUX QUE ÇA writes, in reply to O. H. O. (*East Dulwich*) (see page 650, Vol. II.):—"Get some plaster of Paris and mix up with white of egg and a little vinegar to a stiff paste. See that your parts to be cemented are properly cleaned, else it is of no use to try. If your glass is smooth and has no edge to hold cement, you had better get a piece of pumice-stone and rough it well. It will be a long time setting, so let it stand for twenty-four hours or so, when you may lift it up without fear."

Blackboard.—MIEUX QUE ÇA writes, in reply to F. T. (*London, N.*) (see page 650, Vol. II.):—"Stain? I suppose you mean to paint it *black* so that you can chalk on it? If so, the following will settle the job. Prime as usual; second coat ditto, and finish with two coats of flat drop black with about half a pound of fine emery to one pint of said black. Keep well stirred up while being used. Three of Japan gold-size to one of turps in last coat."

Terra-Cotta Painting.—A. A. (*Coventry*) writes, in reply to J. E. H. (*Southampton*) (see page 650, Vol. II):—"One would have thought instead of asking questions, J. E. H. would have tried both oil and water colour. I believe Sir Joshua Reynolds was once asked by a fashionable lady how he managed to paint so beautifully. He said, 'Get the right sort of brushes, the right sort of colours, and with the brushes put the colours on the right places.' 'Oh,' she said, 'how easy! I will go home and begin at once.' If J. E. H. knows anything about flower painting or drawing, and will get a little of Young's patent size or a small piece of glue dissolved in water (and keep it warm while he is at work), and then paint his design with it on terra-cotta, he will find his oil-colour will work beautifully on it and dry with a gloss. I have painted a great number of flowers, and landscapes, too, on terra-cotta, and I find the following colours are most suitable:—Burnt and raw sienna, vandyke brown, pink, cobalt, lemon yellow, yellow ochre, and madder lake. There are many other useful colours, but these will do to begin with in addition to flake white."

Blackboard Preparation.—JOHN M. PROCTOR AND CO. (*St. Ann's Ink Works, Nottingham*) write, in reply to M. (*Bolton*) (see page 686, Vol. II.):—"If he will forward his address to us we will gladly send him a sample of blackboard paint. He will find a reference to us in No. 77, Vol. II. of WORK, page 402, September 6th, 1890."

Vaporiser.—W. W. L. (*Wrexham*) writes, in answer to J. B. (*Colchester*) (see page 670, Vol. II.), *re* "Steamy Windows":—"I have some tins of 'preparation' now in my possession, and which are rapidly becoming popular amongst all shopkeepers for the prevention of steam, fog, and frost adhering to glass wherever situated. I shall be glad to send J. B. full particulars if he will write to 2, Manley Road."

Painting Flowers.—MIEUX QUE ÇA writes, in reply to J. E. H. (*Southampton*) (see page 650, Vol. II.):—"I should advise you by all means to use oil-colour for your terra-cotta plates. If you use water-colour, you will find out at the end of a twelvemonth or less that a singular action has been going on, causing your distemper to fall off in little scales, which is very annoying indeed. To work in oil and prevent this, act as follows:—Fill your plates (terra-cotta) with good linseed oil. Let them stand in a clean place for, say, ten or twelve hours. Pour off oil and polish up with rags, and lastly a nice clean wash leather. Wrap each one up in a clean rag and stand in the sun. Remember, don't expose it to the sun. When they have stood, say, for twenty-four hours or so, supposing it to be warm weather—artificial heat is a mistake—have a look at them. If the tone of surface be uniform and hard, take a little fuller's-earth and a clean leather, and again polish (moisten with water of course). See now that there is a nice solid rich dull surface. You can now start with tube colours with the usual tools and in the usual way. If you wish for further information on this subject, I fear you will have to go to someone for lessons. All I could write here would never teach anyone to paint a flower. If you cannot afford to pay for lessons, and have some talent, practise hard, and you may in time astonish yourself."

Gilding.—MIEUX QUE ÇA writes to JACK:—"My last note (see page 602, Vol. II.) on this subject, as you are aware, is intended for inside work where there is no draught or gusts of air to blow your dust about. This note I intend to enable you to gild out-of-doors, as it is too often my misfortune to have to do this severe weather. At your stationer's get two or three pennyworth of white tissue paper. At home on a clean smooth table, board, or sheet of glass, spread your tissue out. Now with a soft lead pencil gently mark it all over in a careless, foolish-looking manner, as you have noticed a child do when trying to write. This done, get about 2 in. of common wax candle, rub it on something to flatten one side of it, and with your left hand placed on the tissue you begin and wax it all over. If you rub too hard, you will cause your wax to tear the tissue and also cause small shavings of wax to come off and stick here and there, and so make a mess. Your top sheet thus far prepared, you fold it nice and straight; fold it again and again, and so on, until you have folded it up to about 4 in. one way and about 3½ in. the other, there or thereabout, the only object being to keep it larger than your leaves of gold. Now with a table-knife begin and cut it as you would cut this paper, only you must go all round the edges of the tissue, taking care to leave no edge or fold uncut. You will find some trouble in this if you have never done so before. Now, you see, as you cannot see which side of those leaves are waxed, the pencil marks tell you at once, for of course the folding and re-folding cause the waxed sides to be some up and some down. Take hold of your book of metal in the manner of rough sketch, beginning at the leaf next the table when in this position. Now let the first leaf of book slip, as it were, from your thumb. You will, by this means, expose one leaf of metal to view. With your right hand lift one leaf of tissue, and pencil side down or next to gold; pop it into book, and gently close the book without letting go your hold, and before raising your hand again let slip another, and so on, as fast as you like. When full, gently press it. 'But hereby hangs a tale.' I cannot tell you what pressure to exert unless I were to wax it myself. This is what we call transfer in the trade. You apply the tissue leaves with gold on them to tacky size with pad of mad. I use my thumb."

Tuning Concertina.—J. W. (*Homerton*) writes, in reply to C. I. (*Addingham*) (see page 686, Vol. II.):—"I should advise him to write to Mr. Fletcher, Fletcher's Music Stores, opposite Sun Street, Bishopsgate, London, giving him full particulars, and no doubt he will be able to come to terms about his concertina."

Painting a Blackboard.—T. E. U. (*Rotherham*) writes, in reply to M. (*Bolton*) (see page 686, Vol. II.):—"Take half a gallon of shellac varnish, 5 oz. of lampblack, 3 oz. powdered iron ore, or emery. If too thick, thin with alcohol. Give three coats of the composition, allowing each to dry before putting on the next. The first coat may be of shellac and lampblack only. The 'Harvard' liquid slating sold by paint-houses is likewise an excellent preparation for this purpose, but I do not know if it can be bought in England. The above is an extract from the *Scientific American* of December 24th, 1887."

Gate Designs.—W. A. Y. writes, in reply to G. A. T. (*Ilfracombe*) (see page 634, Vol. II.):—"He will find Bayliss, Jones, & Bayliss, of Wolverhampton, or Hill & Smith, of Brierly Hill, Dudley, will send him designs of gates if he is a bonâ-fide tradesman."

Mute.—W. A. (*Cambridge*) writes, in reply to VIOLIN (see page 650, Vol. II.):—"I made a very effective mute out of a piece of stiff brass wire about 12 or 14 W. G. Bend this into something of the shape of a M, and set the middle leg out a little; this will fit on the bridge between the strings, and is at once cheap and efficient."

Glass Cement.—M. writes, in reply to O. H. O. (*East Dulwich*) (see page 650, Vol. II.):—"Use the finest plaster of Paris mixed to the consistency of thick cream; put it on quickly, as the plaster soon sets; clean off all oil before joining. This can be procured from a plasterer."

Painting Flowers.—M. writes, in reply to J. E. H. (*Southampton*) (see page 650, Vol. II.):—"Use oil colours in tubes, mixing them with megilp; when dry, varnish painted part only with best copal varnish. In purchasing the material, state the purpose for which they are wanted."

Cabinet Fittings.—M. writes, in reply to W. H. (*Hinchley*) (see page 602, Vol. II.):—"You can get these from Messrs. J. H. Skinner & Co., East Dereham. Send 3d. for their catalogue, which gives drawings."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—J. B. (*London, W.C.*); B. W. (*No Address*); H. B. S. (*Liverpool*); F. W. E. (*Woolwich*); LABOURER; J. J. (*Ottawa, Canada*); LEARNER; C. J. P. (*Derby*); A. R. (*Scorrier*); AN ANGLER; COALY TYNE; J. E. (*Upton*); PHOTOGRAPH; SANITARY; J. M. (*Parkestone*); BUYER; L. F. (*Maidenhead*); A. B. (*Dundee*); NOVICE AT WORK; M. P. B. (*Chiswick*); JERRY; W. W. M. (*Glasgow*); J. N. (*Manchester*); J. C. D. (*Southport*); SQUARE PEG; C. E. K. (*Hoshiapur, N. India*); T. L. D. (*Dewsbury*); C. G. W. (*London, N.*); C. B. (*Huddersfield*); J. J. (*Guernsey*); J. S. (*Jedburgh*); J. E. S. (*Stoke-on-Trent*); E. P. W. (*Warrington*); AN INQUIRER; C. W. S. (*Liverpool*); R. H. (*Southport*); A. L. L. (*Farnham*); A. B. (*Suffolk*); H. C. (*Herts*); CLYDESIDE; J. McB. (*Sheffield*); W. H. (*Belfast*); W. B. (*Manchester*); G. H. E. (*West Bromwich*); WORKER BEE; COMP.; W. J. E. (*North Wales*); J. E. W. (*Wolverhampton*); E. P. (*Warrington*); A. T. S. (*Lincolnshire*); H. P. (*Leeds*); W. G. B. J. W. (*Bristol*); BERTIE.

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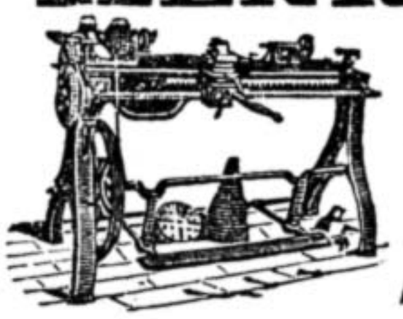

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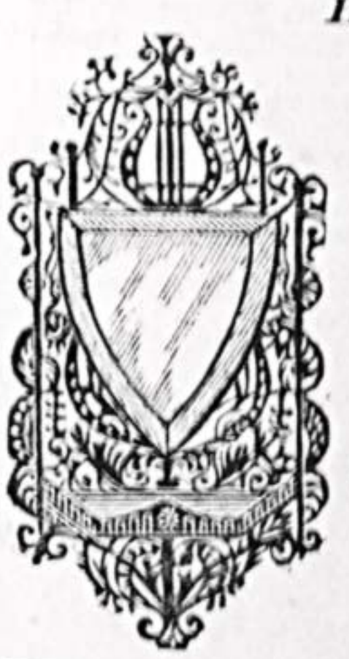

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